The Effects of Playing Nintendo Wii on Depression, Sense of Belonging, Social Support, and Mood among Australian Aged Care Residents: A Pilot Study

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Statement of Authorship

Except where explicit reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or part from a thesis by which I have qualified for or been awarded another degree or diploma. No other person's work has been relied upon or used without due acknowledgement in the main text and reference list of the thesis.

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Abstract

Adults aged 65 years or older constitute the fastest growing age group worldwide, leading to greater numbers of people requiring care in residential facilities. Adults in these facilities have higher levels of depression, lower levels of social support, and lower levels of sense of belonging compared with older adults living in the community. Research has begun to assess the effectiveness of interventions aimed at improving the mental health of aged care residents. Within this population, cognitive and physical benefits of playing video games have been documented in the literature, as well as greater social interaction, and decreased loneliness. The aim of the current study was to investigate the effectiveness of playing Wii bowling twice weekly, with up to 3 other residents, for 6 weeks. An Australian sample of 31 women and 8 men between the ages of 65 and 95 years (*Mean age* = 85.68, *SD* = 9.62) were randomised to either a treatment or control group based on their place of residence. The residents completed demographic information, The Veterans Affairs Saint Louis University Mental Status Exam, the Geriatric Depression Scale Short Form, the Social Provisions Scale, and three visual analogue scales to measure sense of belonging and mood. These scales were completed pre-intervention (0 weeks), post-intervention (6 weeks), and at 2-month follow up (14 weeks). Qualitative data on social interaction between group members was also collected at weeks 1, 3, and 6. Results did not support the use of the Wii to improve residents' self-reported levels of depression, social support, sense of belonging, or mood. Social interaction increased over the 6 weeks, as measured by interaction analyses and also residents' comments. Overall, findings indicate that Wii bowling may be a useful intervention as part of a comprehensive care program to increase social interaction within aged care. Pervasive environmental problems associated with aged care, as well as participant characteristics, may have reduced the effectiveness of the intervention program.

The Effects of Playing Nintendo Wii on Depression, Sense of Belonging, Social Support, and Mood among Australian Aged Care Residents: A Pilot Study

The Australian population is ageing, with one in every seven Australians currently aged 65 years or older (Australian Institute of Health and Welfare, [AIHW], 2012a). As of June, 2012 there were 3.22 million people in Australia aged 65 years and over, which represents an increase of 26% since June 2001 (Australian Bureau of Statistics, [ABS], 2012a). Older adults (aged 65 years and over) currently make up 14% of Australia's total population (ABS, 2012a). Within the population of older adults, 1.8% of the population are aged 85 or older (ABS, 1994), which is an increase from 0.8% of the population 25 years ago (AIHW, 2012c). It is expected that by the year 2026, 18.7% of the Australian population will be over the age of 65, and 2.4% of the population will be aged 85 years and older. Older women outnumber older men, and this increases with age. For example, 54% of all people aged 65 years and older are women and this increases to 66% among those aged 85 years and older (ABS, 2012a).

Worldwide, the fastest growing age group are people aged 65 or older. The World Health Organisation (WHO, 2002) has estimated that the population of older adults will grow by 223% by the year 2050. In 2050 it is estimated that there will be 2 billion older adults, of which 80% are expected to be living in developing countries (WHO, 2002).

One of the consequences of an aging population is the increase is psychological and physical disabilities. In the age group 65 to 74 years, 50% of the population report having a disability and this increases to 68% of the population aged 90 years and over (ABS, 2012b). In the population of older adults, 19% have been identified as having a profound or severe disability. Older women have a higher rate of severe disability (22%) compared to older men (16%; ABS, 2012b). The causes of disability include diseases of the musculoskeletal system, arthritis, back problems, heart disease, diseases of the

circulatory system and respiratory system, and behavioural problems (ABS, 2009). Among older Australians, it is estimated that 10% have dementia, increasing to 30% in those aged 85 years and over. By the year 2050 it is estimated that the number of people with dementia will triple (AIHW, 2012b). Due to the increasing amount of time spent in old age and the high level of disability and dementia in older adults, residential aged care facilities, community care, and flexible care services are widely utilised in Australia (AIHW, 2012c).

Residential Aged Care Residents

The majority of older adults live in their own home (83%; ABS, 2005). Ageing in place is encouraged for older adults as this maintains a level of independence (Stuck, Egger, Hammer, Minder, & Beck, 2002). Home visitation programs have been established to allow older adults to stay in their own home longer, as ageing in place can prevent functional decline, postpone residential care admission, and lower mortality rates (Stuck et al., 2002). Home visitation programs are more effective in the young-old (65-85 years) compared with the old-old populations (85 years and older; Stuck et al., 2002). It can become necessary for older adults to receive assistance to stay in their own home, or to move into residential care facilities (AIHW, 2012c). The three types of care provided for older adults in Australia are residential aged care (nursing homes and hostels), community care, and flexible care systems (AIHW, 2012c). Residential aged care facilities provide residential accommodation on a permanent or a respite basis, along with meals, laundry, cleaning, and personal care services. Nursing, medical care, and activities are also provided in the home.

Until recently, in Australia there were two types of residential care provided, high level care and low level care. The type of care provided was dependent on the needs of the resident. Low level care homes provided accommodation and personal care services

such as meals, cleaning, and laundry services. High level care homes offered the same services but were suitable for people with greater needs. This type of care usually involved 24 hour nursing care and health services. Approximately one third of residents were in low level care, and two thirds of residents were in high level care (Davison et al., 2007). As of 1 July, 2014 the Australian Government facilitated the removal of the distinction between high level and low level care in permanent residential facilities. This was introduced to encourage ageing in place and facilitate ongoing care based on the personal requirements of each resident (Australian Government, 2014).

Currently in Australia there are 2760 facilities providing residential aged care places for 169,001 older adults (AIHW, 2012c). Aged care residents make up approximately 5% of the population of adults over 65 years of age (Residential Aged Care in Australia, 2010-11). Of these residents, 98% are permanent and 2% are receiving respite care (AIHW, 2012c). The proportion of older adults residing in care increases with age. There are 1% of people aged 65 to 74 years, 7% of people aged 75 to 84 years, and up to 31% of people aged 85 years or over, in care (ABS 2004). Most of the residents in care are women (70%) due to a greater proportion of women in the older age groups. The majority of female residents (64%) are widowed, whereas a minority of male residents are widowed (26%). Approximately half of the residents currently in care are 85 years and older (AIHW, 2012c).

The length of time spent in residential care can vary depending on individual needs and health status, with approximately 38% of residents in care for less than a year (AIHW, 2012b). The average length of stay is 2.8 years. Due to the nature of residential aged care, most of the residents leave due to death (91%), with only a small proportion (4%) leaving to re-join the community (AIHW, 2012c).

Residential aged care facilities aim to provide support for both the physical and

the psychological issues that can arise throughout old age. Due to this, it is essential that residential aged care facilities actively ensure that quality of life is maintained for their residents regardless of their care requirements. Quality of life in old age has become a focus of the World Health Organisation (WHO, 2002). Gibson, Carter, Helmes, and Edberg (2010) have put forward principles regarding the provision of care to older adults to ensure quality of life and care is maintained. These principles endorse a continuum of easily accessible care, from in-home to long term residential care. The main objective when assessing the provision of quality care is that all dimensions in relation to the recipient, including the physical, psychological, social, and spiritual needs, are met within the care plan (Gibson et al., 2010). The care provided should also address all aspects relevant to the resident, such as organisational structures, environment, care approaches used, and the relationship between the resident and the care provider. Respect and dignity for the individual receiving care should be maintained and be of the utmost importance in the provision of care (Gibson et al., 2010). When these needs are met, it is theorised that older adults can achieve a greater sense of purpose in their lives regardless of their living arrangements (Gibson et al., 2010). It is also important for older adults to enjoy an engaging old age that enables them to meaningfully and actively participate in their ongoing life decisions whenever feasible.

The World Health Organisation has promoted the concept of Active Aging (WHO, 2002). Active Ageing is the “process of optimising opportunities for health, participation, and security in order to enhance quality of life as people age” (WHO, 2002, p. 12). Active Aging encourages continued participation in different aspects of life as someone ages. A set of determinants have been suggested to help older people enjoy a good quality of life (WHO, 2002). These determinants describe the importance of providing health care, healthy lifestyle and activities, physical and psychological support, physical and social

environments, and safe economical environments. In residential care, it is also important to ensure that residents have access to meaningful leisure activities. Residents should also be afforded the opportunity to participate in their own life choices and allowed active engagement with their physical surroundings (Van Malderen, Mets, De Vriendt, & Gorus, 2013). These determinants provide a framework for health care professionals to encourage older adults to participate actively as they age, which in turn relates to lower ongoing medical and care costs (WHO, 2002).

The determinants outlined by the World Health Organisation have been supported by Grant (2007). Grant conducted research on the daily lives of older adults living in residential facilities in New Zealand. It was found that when participants had purpose in their lives and felt a sense of belonging to a safe, secure, and supportive community, participants' overall quality of life was enhanced. Prieto-Flores, Fernandez-Mayorals, Forjaz, Rojo-Perez, and Martinez-Martin (2011) also found that residential satisfaction and sense of belonging were protective factors for older adults in both community and residential settings. It is, therefore, important to provide a high level of care to older adults within residential facilities, however the decision to move into care can have long term effects on the overall well-being of residents.

The decision to relocate to residential care, and the process of moving, is a significant and stressful life event for older adults. The transition into residential care is shaped by how the relocation is perceived by the older adult, and if the relocation is their choice or a necessity (Lee, Simpson, & Froggatt, 2013). If the move is involuntary the associated stress can increase, which in turn reduces adaptation to the new environment (Chao et al., 2008). The perceptions about the move, such as the desirability and the individual's degree of choice, control, and acceptance of the move can also influence how the person copes. A relocation resulting in poor adjustment is associated with feelings of

powerlessness in response to crisis (Lee, et al. 2013).

There are a number of factors that can improve a resident's satisfaction with the move into aged care, which in turn can lower the associated stress. Residents who are encouraged to form social relationships within the home are more likely to have a successful adjustment to the new environment (Lee, 2010). It is also important for the new residents to feel at home, which can be achieved by incorporating a sense of interpersonal warmth, physical comfort, an investment in the environment, and freedom of the self (Young, 1998). If all of these elements are addressed, residents are able to achieve a feeling of being at home and successfully adjust to the new environment with lower levels of stress (Young, 1998). The quality of food provided in the home and the number of roommates can also have a profound effect on well-being due to potentially creating a feeling of being at home (Chao et al., 2008; Street, Burge, Quadagno, & Barrett, 2007).

Aged care residents, particularly newly arrived residents, are at an increased risk of depression due to the changes in their living arrangements (Walker, Curry, & Hogstel, 2007). Mental health issues, such as depression, can also arise more frequently in residents due to a number of life style and physical changes. Aged care residents often experience more stressful events such as the loss of family, friends, and community. They can also experience a decline in their health that can make them vulnerable to mental health issues (Schwarzer, 1991). These issues can arise more frequently in aged care residents when compared to community residents. The increased life expectancy and growing population of older Australians necessitates the improvement of the mental health and welfare of this group and it is now an area where a greater level of research activity is occurring.

Depression in Older Adults

The diagnostic requirements of a Major Depressive Disorder include depressed mood, loss of interest or pleasure, changes in weight (without dieting), difficulties sleeping, psycho-motor agitation or retardation, fatigue, feelings of worthlessness, difficulty concentrating, and suicidal ideation (American Psychiatric Association, [APA] 2013). A diagnosis of depression according to the DSM 5 requires at least five symptoms to be present during the same 2 week period (APA, 2013).

Depression can cause significant emotional suffering for older adults, which in turn can result in a diminished quality of life and a decline in physical health over time (Casey, 2012). The symptoms of depression in older adults may be overlooked due to the co-occurrence with grief, dementia, and medical illnesses which are common in old age (Casey, 2012). Older adults with depression are at a higher risk of experiencing significant functional decline when compared to younger sufferers (Casey, 2012). Older adults who give up their daily activities and become dependent due to their depressive symptoms can have a rapid loss of physical functioning that can be severely disabling (Casey, 2012).

Low or depressed mood is one of the diagnostic requirements of a Major Depressive Disorder period (American Psychiatric Association, 2013). Mood has been defined as a temporary, internal state or feeling. Mood is a highly subjective concept, and can be experienced very differently for individuals based on personal preferences (Amado-Boccara, Donnet, & Olié, 1993). Older adults who are clearly suffering from a depressive disorder may refer to the symptoms as anxious or bad mood, rather than depressed (Gallo & Rabins, 1999). Low mood is associated with a number of negative outcomes for older adults such as an increased risk of mortality (Lavretsky et al., 2010), and an increase in the risk of developing dementia (Devanand et al, 1996).

Depressive symptoms that do not meet the criteria for a diagnosis of depression may be classified as subclinical depression. Symptoms may not meet the criteria as they are not present in the same 2 week period, or other symptoms are present without depressed mood or loss of interest (Meeks, Vahia, Lavretsky, Kulkarni, & Jeste, 2011). The presence of subclinical depression is associated with a greater risk of developing a major depressive disorder later in life. It is estimated that the risk of developing major depression when subclinical depression is present is between 8-10% per year (Meeks et al., 2011). Subclinical depression is associated with a decrease in the quality of life experienced and an increased use of health care systems among older adults (Cuijpers & Smit, 2004; Meeks et al., 2011).

The prevalence of depression in persons aged 65 years or older living in the community has been estimated to be between to be between 2% and 5% (Casey, 2012), but higher levels have been reported (e.g., 8.2%, Pirkis et al., 2009; 8.7%, McDougall et al., 2007). The levels of depression in community dwelling older adults is higher than the levels seen in the general Australian adult population (4.1% of people aged 16-85 years; ABS, 2007). A person's gender influences the levels of depression experienced across the life span. Community dwelling older women (10.4%) have higher levels of depression when compared to older men (6.5%; McDougall et al., 2007; Wilhelm, Mitchell, Slade, Brownhill, & Andrews, 2003).

The rate of depression in aged care residents has been reported by a number of studies, however there is a wide variance in the reported depression rates. In a meta-analysis of 36 studies, the average level of depressive symptoms in aged care residents was found to be 43.9% (Jongenelis et al., 2003). In a more recent meta-analysis, the rate of depression was found to be between 14% and 42% (Djernes, 2006). In other studies the levels of depression have been found to be between 10% (Seitz, Purandare, & Conn,

2010) and 20.3% (Jones, Marcantonio, & Rabinowitz, 2003). In aged care populations, the rate of minor depression (27%) and subclinical depression (17%) combined is about three times higher compared to major depression (15%; Judd et al., 1998). The presence of subclinical depression in aged care has been found to be as high as 24% (Jongenelis et al., 2004).

In Australian aged care facilities the rate of depression is 40.5% of residents in high level care and 25.4% of residents in low level care (Snowdon & Fleming, 2008). In other studies the rate of depression across all types of residential care was found to be between 16.9% (Davison et al., 2007) and 23% (Snowdon, 2010). In recently admitted Victorian aged care residents, depression was at its highest level in the first month, with 24% of residents having symptoms of a Major Depressive Disorder, and a further 20% of residents presenting with symptoms of a non-major depressive disorder (McSweeney & O'Connor, 2008). Regardless of which prevalence rate is cited, the levels of depression in aged care residents is at least three to four times higher than community dwelling older adults (Jongenelis et al., 2004).

Aged care residents are at an increased risk of underdiagnosis of depressive symptoms (Jongenelis et al., 2003). Aged care facility staff do not always recognise the signs and symptoms of depression in older adults, which can result in the residents not receiving the appropriate treatment and a worsening of their symptoms (Bagley et al., 2000). The early recognition and treatment by staff is crucial to prevent further psychological and physical deterioration (Bagley et al., 2000). Bagley et al. compared formal depression assessment of residents to staff identified depression. The staff recognition of depression symptoms in residents was low. Of the residents diagnosed with depression using formal assessment, only 15% to 27% were identified as depressed by staff. This has also been supported by Teresi, Abram, Holmes, Ramirez, and Eimicke

(2001) who found that only 37% to 45% of cases of depression diagnosed by a psychiatrist had been identified by staff.

The reported prevalence rates of depression in older adults may be underestimated due to recruitment challenges that arise from sampling an older population (McSweeney & O'Connor, 2008; Thompson, Heller, & Rody, 1994). Methods of recruitment may unintentionally miss at risk or depressed older adults. There is also a low rate of response across subgroups of the elderly population who are at a higher risk of developing depression. Older adults with lower social economic status, poor health, and low social integration have been found to be unwilling to participate in research (Thompson et al., 1994). Participants who are experiencing depression are also more likely to refuse research invitations (Thompson et al., 1994). It has also been found that older women who were identified as depressed were less likely to continue to participate in follow up or longitudinal research (Thompson & Heller, 1993). Depression is more likely to occur co-morbidly with chronic illnesses which may also prevent participation in research and treatment (Bisschop, Kriegsman, Deeg, Beekman, & van Tilburg, 2004).

Older adults can also present with symptoms of depression such as a loss of interest in activities and ongoing somatic complaints that can be mistaken for the normal process of ageing. Older adults may also be unwilling to mention any psychological symptoms to avoid becoming a burden to caregivers or aged care staff (Gallo & Rabins, 1999). Older adults have been found to also avoid using the word depression to describe any symptoms they may be experiencing and also may avoid reporting depressive symptoms to a medical practitioner (Davison et al., 2007; O'Connor, Rosewarne, & Bruce, 2001). The combination of these factors suggests that the true prevalence rates of depression may be higher than previously reported.

Depression in older adults is associated with a number of physical and

psychological outcomes, such as decreased overall well-being and a poor quality of life (Casey, 2012). Older adults with depression are also at an increased risk of dementia (Korczyn & Halperin, 2009). In aged care, depression is associated with an increased chance of mortality for residents over a 12 month period when compared to non-depressed residents (Barca, Engedal, Laks, & Selbaek, 2010). In one year, there were 2.1 times as many deaths of severely depressed aged care residents when compared with non-depressed residents (Watson, Garrett, Sloane, Gruber-Baldini, & Zimmerman, 2003). This finding was also supported in a longitudinal Australian study of older adults residing in the community. In this study mortality was higher after 3-4 years in participants originally diagnosed with depression than those who were not (Henderson et al., 1997).

Older adults who are depressed are also at an increased risk of suicide due to the association between depression, suicidal ideation, and physical illness (Bergman, Barak, Sigler, & Aizenberg, 2011; McLaren, Gomez, Bailey, & Van Der Horst, 2007). The rate of suicide in men over 85 years of age is 32.1 per 100,000 males, which is the highest age-specific suicide rate in all male age groups. Women aged 85 years and over have the highest female age specific suicide death rate at 7.8 deaths per 100,000 (ABS, 2011).

In summary, the research literature demonstrates that the prevalence rates of clinical and subclinical depression are substantially higher in aged care residents than in community dwelling older adults. Aged care residents are also at an increased risk of under diagnosis, and a diminished quality of life due to depression symptomatology. The high levels of suicide and depression in older adults in residential aged care may be attributed to a number of population specific risk factors.

Risk factors for depression. There are a number of risk factors for depression across the lifespan. Gender is a risk factor for depression in all age groups. Women have a higher risk of depression in adolescence, adulthood, and older adulthood (Essau,

Lewinsohn, Seeley, & Sasagawa, 2010; Luppa et al., 2012). It is hypothesised that women are more vulnerable to depression due to a greater tendency than men to ruminate (Nolen-Hoeksema, Larson, & Grayson, 1999). Rumination involves focusing on the current symptoms and consequences of depression. This, in turn, can increase the experienced symptoms of depression (Nolen-Hoeksema & Jackson, 2001).

Current and past marital status has a long term effect on the level of depression experienced. Being previously married has been correlated with the development of depression in later life (Wilhelm et al., 2003). In current relationships, married older men have the lowest rates of depression compared to unmarried men, but married older women have similar levels of depression to unmarried women (St John & Montgomery, 2009). Older adults who are currently involved with a partner (married and not married) are less lonely, but if this relationship is dissatisfying older adults may still be at risk of developing depression (Peters & Liefbroer, 1997; St John & Montgomery, 2009). The effect of marital status on depression may be different at an individual level as other factors such as the presence of strong family support structure or meaningful friendships may mediate the effects of unsatisfying relationships and widowhood (Zhang & Li, 2011).

Residential aged care residents are at an increased risk of depression and the associated negative outcomes due to population specific risk factors. Due to the nature of aged care, residents are more likely to present with physical health problems which has been found to correlate with depressive symptoms (Barca et al., 2010). Older adults with a chronic physical condition are twice as likely to have a mood disorder than older adults with no physical impairments (Gadalla, 2010). Higher levels of pain, functional impairment, disability, poor self-assessed health, and chronic illness can also increase the likelihood of depressive symptomatology in aged care residents (Cuijpers & Van Lammeren, 1999; Jang, Bergman, Schonfeld, & Molinari, 2006).

Within residential care facilities, environmental factors may also contribute to higher levels of depressive symptomatology. Factors associated with institutionalised living such as loss of freedom, autonomy, privacy, social isolation, reoccurring death and grief in the home, lack of purpose, high staff turnover, and boredom have been identified as causes of depression in residents (Choi, Ransom, & Wyllie, 2008; Davison, McCabe, Knight, & Mellor, 2012; Dow, Lin, Tinney, Haralambous, & Ames, 2011). Loneliness and a lack of social support also have a strong association with depression in aged care facility residents (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006; Jongenelis et al., 2004; Prieto-Flores et al., 2011). Within aged care, younger residents with better cognitive functioning have been found to have higher levels of identified depression (Jones et al., 2003). This may be due to the restrictive nature of the residential care environment for the less cognitively impaired residents.

Residents in care are also at an increased risk of depression due to a lack of environmental mastery and purpose in their lives (Davison et al., 2012). Environmental mastery has been defined as the ability to manage effectively one's life and surrounding environment (Ryff & Keyes, 1995). The residential care environment is likely to reduce mastery in residents resulting in a decrease in quality of life. Mastery is reduced as homes do not provide many opportunities for residents to make decisions about their day to day activities or care. Other issues that arise in old age, such as disability and changes in financial status, can also reduce feelings of mastery (Jang, Chiriboga, Lee, & Cho, 2009). In older adults, higher levels of mastery have been shown to be protective against psychological distress (Gadalla, 2010). Knight, Davison, McCabe, and Mellor (2011) report that 49% of the variance in depression scores in aged care residents can be attributed to their reported level of mastery. Aged care residents are unable to control their daily routines, which can reduce feelings of mastery over their environment, and in turn

contribute to an increased risk of depression, psychological distress, and health concerns (Davison et al., 2012; Forbes, 2001).

Loneliness. Loneliness is risk factor for depression in older adults (Tiikkainen & Heikkinen, 2005). This is due to age-related changes in their lifestyle, such as retirement and the relocation to an aged care residential facility. The very old, widows, widowers, and the disabled are at the greatest risk of problematic loneliness, which is an unwelcome feeling of being alone (Forbes, 1996). For some people being alone is a desirable state, however for others it is may be unbearable and become problematic (Forbes, 1996). Pinquart and Sörensen (2003) have conducted a meta-analysis and found that over time there is a slight increase in loneliness with old age, especially in the very old.

Approximately 10% of older adults report frequent loneliness (Pinquart & Sörensen, 2003). The prevalence rate of loneliness in aged care residents is 11.3%, but has been reported to be as high as 56% (Drageset, Kirkevold, & Espehaug, 2011; Tiikkainen & Heikkinen, 2005). The variability in the prevalence rate of loneliness may be due to differences in individuals and across aged care environments.

Loneliness is strongly associated with higher levels of depression in older adults, even after controlling for variables such as gender, age, ethnicity, education, income, marital status, social support, and perceived stress (Cacioppo et al., 2006; Tiikkainen & Heikkinen, 2005). It is unclear if loneliness causes depression or if older people who are depressed are unwilling to maintain their social network, resulting in an increase in reported loneliness (Tiikkainen & Heikkinen, 2005). Older adults who are depressed may no longer actively participate within their social networks, which in turn may reduce their social networks and increase levels of loneliness. Loneliness is also associated with higher mortality rates (Dénes, 1980), psychological distress (Paul, Ayis, & Ebrahim, 2006), poor physical health, worse sleep, and a deterioration of cognitive functioning over

time (Luanaigh & Lawlor, 2008).

The number of social contacts an individual may possess is not always a measure of how alone someone may feel (Drageset et al., 2011). This is because each individual has different needs regarding the type of contact made and the number of interactions. Emotional closeness and the quality of social support is more important than the frequency of contact with others (Drageset et al., 2011). The residential aged care environment does not always help to alleviate loneliness in older adults, even though residents are often in contact with others. Harper (2002) has found that the aged care environment does not promote well-being or the formation of meaningful friendships. In this study, participants were assessed at five minute intervals and it was found that 65% of their time was spent doing little or nothing. The majority of residents in this study spent their time in their rooms alone. Of the remaining time, 12% was spent in social activities. These activities did not necessarily help to alleviate the boredom or loneliness as the time spent in activities may not engage the residents (Harper, 2002).

Within residential aged care facilities, residents may be in the constant company of people with whom they have very little in common with. This creates feelings of isolation and loneliness even when they are in the company of other people (Knight & Mellor, 2007). Residents may also have limited or no connection with others in the surrounding community. If family members have died or moved away residents may no longer receive any visitors (Choi et al., 2008). The environment is isolating and can be very lonely as the opportunities to leave the aged care facility on outings may be very limited (Choi et al., 2008). To decrease the levels of loneliness in residential care residents, and in turn reduce the associated negative outcomes, residents need to maintain high levels of social support and to be included in supportive social networks provided by a number of both internal and external sources.

Social Support

Social support is defined as “the interactive process in which emotional, instrumental, or financial aid is obtained from one’s social network” (Bowling, 1994, p. 41). The level of social support obtained can change over time, and be either positive or negative in someone’s life (Bowling, 1994). Social support is a multidimensional concept, as the type of support received can differ depending on the source. Support can be instrumental, such as physical and financial assistance, or emotional support. Each type of support provides a feeling of being in a group and that one is cared for.

Weiss (1974) outlined six provisions to encompass all aspects of social support that we receive from other people. The six provisions include attachment and emotional closeness, social integration, reassurance of worth, reliable assistance, guidance, advice, and the opportunity for nurturance. Each of these provisions contribute to the level of social support received. These provisions should be provided by a number of sources such as partners, family, and neighbours (Tomaka, Thompson, & Palacios, 2006). The size of someone’s social network is dependent on individual factors such as socio-demographic, cultural, and personal factors (Bowling, 1994).

High levels of social support can provide a number of benefits, however the benefits of higher levels of social support are only seen when the support is meaningful. Social support is not just a measure of how many different people someone knows. It is important that the social support received is meaningful and engaging to the person receiving it (Gadalla, 2010). Women and men who are older experience social support in different ways. Women draw on friends, relatives, and their children for emotional support, whereas men receive support primarily from their wife or partner (Gurung, Taylor, & Seeman, 2003).

Understanding why social support is protective to someone’s psychological and

physical health is essential, however further research in this area is required. The presence of higher levels of social support may in turn, improve physiological functioning (Uchino, 2006). Higher levels of social support may also reduce stress by providing support in response to stressful life events (Holt-Lunstad, Smith, & Layton, 2010). Someone may draw on their social support networks to buffer stressful events, therefore limiting the negative effect on their health. Participation in social support networks may also reinforce societal norms, which in turn encourages healthy behaviours and maintenance of self-care (Holt-Lunstad et al., 2010).

There are a number of benefits for older adults who have strong social support networks. Increased social activity is a consistent predictor of happiness, life satisfaction, and better health due to a sense of being accepted and cared for (Cooper, Okamura, & Gurka, 1992; Mathieu, 2008; Tremethick, 1997). The presence of high levels of social support can buffer the effects of stressful life events such as death of a family member or friend in older adults (Schwarzer, 1991). Schwarzer has found that when there was no or minimal support received after a stressful life event, older adults were more anxious. An active and socially integrated lifestyle may also protect older adults from developing dementia and improve cognitive function (Fratiglioni, Paillard-Borg, & Winblad, 2004). Voluntary social interaction with friends, compared to family members, has the greatest impact on improvements in cognitive functioning in older adults (Glei et al., 2005). This may be because social contacts with friends maintain an older adult's independence. Relationships with family members may provide support and assistance, whereas relationships with friends provide companionship and encourage autonomy (Tiikkainen, Leskinen, & Heikkinen, 2008).

The process of ageing results in older adults becoming more vulnerable to decreases in their social support network over time. This is due to age-specific

experiences such as declines in health, retirement, loss of spouse or friends, and the possibility of relocation to a residential care environment (Gurung et al., 2003). In addition, the likelihood of losing a spouse or a close friend increases with age (Gurung et al., 2003). Social support networks can decrease due to the loss, however this loss may also prevent new relationships from forming. Park, Zimmerman, Kinslow, Shin, and Roff (2012) found that the death of a close friend or spouse may lead to aged care residents avoiding closeness with others to minimise the emotional effect of further potential losses. Increases in cognitive impairment can also increase the number of negative interactions with others, which in turn may decrease the level of social support received (Gurung et al., 2003).

Lack of social support can lead to an increase in the levels of depression and loneliness in older adults (Oxman, Berkman, Kasl, Freeman, & Barrett, 1992; Tsai & Tsai, 2011). Social isolation can also predict an increase in mortality rates; this is at a rate comparable with that of cigarette smoking (House, 2001). Fewer social support contacts is also associated with higher levels of suicidal ideation (Vanderhorst & McLaren, 2005) and poor physical health in community dwelling older adults (Cutrona, Russell, & Rose, 1986). The type of support received has an impact on the psychological outcomes for older adults. Increased emotional support is associated with lower levels of depression (Oxman et al., 1992). In contrast, tangible support, such as physical help may not have a significant effect on depression in older adults. This is because although physical support is provided, it may be demeaning or paid support such as in residential care facilities (Oxman et al., 1992).

The process of relocating to a residential facility may reduce social support networks for older adults further, and over time loneliness can increase (Winningham & Pike, 2007). Care facilities may also place restrictions on social interactions reducing the

opportunities to develop emotional closeness with others (Drageset, et al., 2011). Older adults who are in residential care with a number of other people do not necessarily have higher levels of social support as the environment does not often result in close bonds. Practices in residential care facilities such as assigned seating during meals, routines, and the discouragement of spontaneous activities can prevent meaningful social interactions and relationships within the home (Park et al., 2012). These practices also prevent new relationships from forming (Park et al., 2012). Knight and Mellor (2007) found that although the facility valued and encouraged participation in social activities, residents reported that they were isolated even when in the company of other people. Participation in activities with others may not always result in meaningful relationships forming within the home.

The development of meaningful social interactions within the home is especially important for older men as they are a minority within the home, which may result in a decrease in the opportunities for desirable social relationships to form (Park, Knapp, Shin, & Kinslow, 2009). Within residential facilities, women outnumber men. The types of activities run in care facilities often do not cater to men's interests or needs. Park, Knapp, Shin, and Kinslow (2009) conducted an in-depth study on men's experiences in residential facilities. It was found that when compared to female residents, male residents had lower perceived social support and their social ties were weaker. Men were also less likely to be satisfied with their lives, less likely be involved in reciprocal relationships, and less likely to participate in activities. Men also experienced a lack of desirable relationships within the home due to the higher prevalence of female residents. In this study, several men formed close relationships with staff to meet their need for emotional closeness with others. Residential aged care staff are able to provide residents with ongoing, meaningful social support.

For some residents their main social contact is with staff. The attitude and involvement of the staff in the relocation to the home and daily activities can increase well-being (Park, 2009). Residents often develop satisfying long term relationships with staff members when they are perceived as being friendly (Park, 2009; Park et al., 2012). Staff roles can be broadly defined into those of strangers, or as friends open to relationships with residents (Powers, 1992). Members of staff who are friendly with residents provide a unique role in residents' lives. Unlike other residents, staff do not have any hearing or cognitive impairments, making it easier for cognitively intact residents to build a friendship and converse meaningfully with staff over time (Park et al., 2012). Staff in residential care facilities who provide friendship to the residents are an important source of meaning and social support. If the relationship with members of staff can recognise the individual resident and acknowledge the resident as an adult, this can in turn improve self-esteem (Tinney, 2006). For some residents, the relationships with staff members are an alternative to friendships with other residents. Staff members can pay special attention to their individual needs and become genuinely involved in activities with them (Park et al., 2012). Due to this, it is essential for well-being that residents be heard, speak, are recognised, and respected by residential staff throughout their care (Tinney, 2006).

In summary, older adults who move into an residential facilities are at an increased risk of depression, loneliness, and experiencing an ongoing lack of social support (Harper, 2002; Snowdon & Fleming, 2008; Winningham & Pike, 2007). This occurs even though residents are in an environment that has been designed to provide social support and alleviate boredom and loneliness, in addition to providing medical support. Residents in care are also at an increased risk of feeling as though they do not belong to the community in which they live. Knight and Mellor (2007) have proposed that

a combination of unfulfilling social activities and ongoing interactions with unfamiliar people that residents may not have anything in common with, can lead to the development of poor psychological health. Residents may not feel any relatedness to their place of residence, and may not experience any interpersonal warmth with other residents.

Theory of Human Relatedness

A number of theories have been proposed to explain the factors contributing to the reduced quality of life experienced by care residents. High levels of depression, poor social support, and increased loneliness in residents can be partially understood by examining relatedness and the interconnections residents have with their home environment and the people within it. The Theory of Human Relatedness (Hagerty, Lynch-Sauer, Patusky, & Bouwsema, 1993) may account for the decrease in quality of life that residents in aged care facilities experience. According to the Theory of Human Relatedness, the establishment and maintenance of relatedness to others, objects, environments, society, and the self is a pervasive, essential human concern. In respect to this theory, relatedness is a functional, behavioural system rooted in early attachment behaviours. Relatedness has been defined by Hagerty et al. (1993, p. 292) as “an individual’s level of involvement with persons, objects, groups, or natural environments and the concurrent level of comfort or discomfort associated with that involvement”. Relatedness encompasses objects, environments, other people, and groups. Relatedness can be either positive or negative as the individual moves through the four states; connectedness, disconnectedness, enmeshment, and parallelism (Hagerty et al., 1993). This theory was derived from an inductive process that established that we all have a need for meaningful relationships that overcome our separateness.

When establishing and promoting relatedness with the surrounding environment four competencies have been identified by Hagerty et al. (1993). These are sense of

belonging, reciprocity, mutuality, and synchrony. Sense of belonging is an involvement with one's external environment. Reciprocity is the presence of an equitable relationship with one's environment. Mutuality is the acceptance of goals and modes of interchange with one's environment. Lastly, synchrony is the experience of congruence with one's internal rhythms and external interaction with one's environment. Hagerty et al. (1993) proposed that a person will experience greater involvement with another person, object, group, or environment when there are higher levels of sense of belonging, reciprocity, mutuality, and synchrony. Within care facilities there is limited scope for meaningful interactions with people outside of the home, so establishing a sense of belonging within the home is essential to maintaining ongoing psychological well-being in older adults.

Sense of belonging. Sense of belonging is defined as the feeling of being an integral part of a system or environment through involvement with that system or environment (Hagerty et al., 1992). This can be involvement with a country, a region, local community, or family. Sense of belonging has two defining attributes of value and fit, both of which are essential for well-being. It is important to be valued and needed as well as to experience a fit with other people, groups, objects, organisations, environments, or spiritual dimensions (Hagerty et al., 1992). Being valued, needed, and the feeling of belonging are all essential parts of developing and maintaining relationships with other people (Hagerty, Williams, Coyne, & Early, 1996). Hagerty et al. (1992) proposed that precursors for the development of a sense of belonging are energy, potential and desire for involvement, and the potential for shared characteristics. These attributes are necessary to enable an individual to experience a sense of belonging within their life. Without these precursors, the establishment of a sense of belonging may be limited.

There are a number of overall benefits arising from the experience of a sense of belonging. Hagerty et al. (1992) proposed that the positive outcomes when belonging is

present are involvement (psychological, social, spiritual or physical), attribution of meaning to the involvement, and establishment of social responses to other people (Hagerty et al., 1992). Higher levels of belonging have been associated with a number of positive mental health outcomes including higher levels of social support, and lower levels of belonging is associated with loneliness, specifically in women (Hagerty et al., 1996). The relationship between belonging and loneliness is stronger in women because fitting in with other people is more important to their self-concept than it is for men (Hagerty et al., 1996). Higher levels of belonging are also associated with lower levels of depression, leading in turn to lower levels of suicidal ideation in older adults (Bailey & McLaren, 2005), and lower levels mortality among older adults over a 5 year period (Morita, Takano, Nakamura, Kizuki, & Seino, 2010).

Kissane and McLaren (2006) found in an Australian community sample of 104 older adults that higher levels of belonging predicted the presence of more reasons to live. The results also showed that higher levels of belonging were associated with self-belief in their ability to cope with stressful life events. Higher levels of sense of belonging have also been identified as a protective factor against suicide and depression in older adults (McLaren et al., 2007). In an Australian community sample of older women, higher levels of belonging have been found to be associated with better physical and mental health, higher levels of social support, lower stress, and greater levels of physical activity (Young, Russell, & Powers, 2004). Overall, the presence of higher levels of sense of belonging is associated with a number of positive mental health outcomes for older adults.

Belonging to the residential aged care community is an important factor for the ongoing mental health of older adults living in care. There is often limited scope for integration into different community or social groups outside the home due to physical

impairments. Although it is important for older adults to maintain contact with family and friends outside of the aged care facility, the daily interactions with residents and staff are essential to well-being as family and friends cannot be around all the time (Park, 2009). Older adults who integrate and develop social resources within the home instead of relying on outside connections tend to have a better overall psychological well-being than those who do not establish those connections inside the home (Park, 2009). Prieto-Flores et al. (2011) found that sense of belonging in older adults can be a protective factor against loneliness both in community dwelling and aged care residents. In care, the level of residential satisfaction has also been found to positively impact on sense of belonging (Prieto-Flores et al., 2011). This means that when residents are satisfied with their place of residence, they may feel less lonely and experience a sense of belonging to the home.

Older adults in aged care facilities have been found to have lower levels of belonging and higher levels of depression when compared to older adults who reside in the community (McLaren, Turner, Gomez, McLachlan, & Gibbs, 2013). Sense of belonging also partially mediates the relationship between place of residence and depression (McLaren et al., 2013). This means that residing in aged care is associated with lower levels of sense of belonging, which in turn is related to higher levels of depression. It was also established that sense of belonging moderated the relationship between housing type (aged care or community) and levels of depression. Residing in aged care was associated with higher levels of depression only for residents with low or average levels of sense of belonging. Overall these results indicate that residing in aged care is both directly and indirectly, via sense of belonging, related to depressive symptomatology.

In summary, previous research highlights the importance of sense of belonging to the well-being of aged care residents, and indicates the need for interventions to enhance

a sense of belonging within the care environment. Higher levels of sense of belonging are associated with lower levels of depression and loneliness, and better physical and mental health. Increasing the levels of sense of belonging in aged care residents through the introduction of interventions may increase the overall psychological health and well-being of residents (McLaren et al., 2007).

Group engagement. Residents in care can experience an increased risk of depression (Jongenelis et al., 2003), loneliness (Harper, 2002), decreased social support (Park et al., 2012), and decreased sense of belonging (McLaren et al., 2013). Although these are separate concepts, the cause of resident's overall decline may be attributed to an overarching lack of meaningful relationships within their lives, and a lack of engaging activities within residential aged care. Sense of belonging in aged care can be increased through a number of group activity based interventions. It is important to ensure that the interventions offered are appealing to the residents, and provide meaningful and engaging social activity. Merely participating in activities with others may not promote a feeling of belonging to the group or to the home (Bailey & McLaren, 2005).

Residential care facilities often have a number of group based leisure activities available to residents to participate in, however this does not necessarily translate to the formation of meaningful relationships between residents (Knight & Mellor, 2007). Knight and Mellor conducted an in-depth quantitative study of aged care facility residents in Australia. It was found that participation in social activities does not equate to the experience of social inclusion within the home. Residents who do not have meaningful and inclusive interactions with other people in the home do not experience any of the protective factors of social group membership as outlined by Haslam et al. (2009). This has been supported by Park et al. (2012), who found that it is difficult for residents to form meaningful social relationships with others within the aged care environment. Park

et al. argued that the process of being placed together does not automatically result in emotional connections being formed between residents. This in turn prevents social groups forming within the home.

Haslam et al. (2009) argue that the social environment someone lives in has a significant impact on their well-being. This is because membership in different social groups can become internalised and integrated into a person's identity and sense of self. Social groups can provide meaning and a sense of purpose, which in turn results in positive psychological outcomes for group members. Membership in social groups enhances self-esteem and self-worth and can be central to health and well-being. Social group membership also acts as a buffer for stressful life events due to the shared social identity and support provided by other group members (Haslam et al., 2009). Haslam et al. argue that there is scope to increase the mental functioning and the well-being of vulnerable groups, such as aged care residents, through interventions aimed at increasing an individual's sense of shared social identity.

In summary, aged care residents are a vulnerable group and are at risk of a number of psychological problems due to a lack of social support, loneliness, and a lack of meaningful activities in their lives. Group based interventions aimed at increasing social networks in aged care facilities can increase social support and quality of life, enhance cognitive functioning and lower levels of depressive symptomatology (Winningham & Pike, 2007). It is necessary for care facilities to provide activities and interventions that not only alleviate boredom, but provide residents with the social resources and the opportunities to help them build meaningful social bonds with each other.

Interventions

A number of interventions aimed at increasing social relationships within residential care facilities have been developed and researched. O'Sullivan (2005) has

outlined a number of principles that should be adhered to in the development of interventions in residential care facilities to encourage active resident participation. The activities should provide a sense of meaning, a challenge, continuity of self, be needs based, and foster a sense of community. Activities that require a minimal use of skills and contain no challenge are likely to result in boredom (O'Sullivan, 2005). Activities that can motivate residents to actively participate can, in turn, enhance their satisfaction with the facility, enhance a sense of community, and improve their overall mental health (O'Sullivan, 2005). Interventions in residential care that encourage participation in group activities can be broadly classified as aimed at improving depression, encouraging social relationships to form, improving cognitive functioning, or encouraging group engagement in physical activities.

Residents who participate in group activities may experience an improvement in cognitive functioning. Glei et al. (2005) found that older adults who engaged in up to two social activities failed 13% fewer cognitive tasks than those who did not engage in any social activities. Participation in social activities with people outside of the family was found to have the greatest impact on cognitive functioning (Glei et al., 2005). This has been supported by Wang et al. (2006), who found that older adults who watched high amounts of television were more likely to show cognitive impairment. In contrast, participants who played board games with other people and read were less likely to develop impairment in comparison to the participants who only watched television. Engagement in social activities can also result in improvements in cognitive abilities in conjunction with improvements in levels of social support in aged care residents. Winningham and Pike (2007) assigned residents to an intervention aimed at preventing cognitive decline by educating residents about brain and memory function. Compared to the control group, residents participating in the intervention improved their cognitive

functioning, but they also showed improvements in measures of social support and loneliness. This resulted in the intervention group having higher levels of social support and lower levels of loneliness compared to the control group, even though the intervention was aimed at improving cognitive functioning (Winningham & Pike, 2007).

Interventions aimed at increasing aged care residents' levels of social support can be implemented through a wide variety of activities. Schuster (1998) found that engagement in writing groups within aged care facilities established relationships and encouraged personal recognition as valued members of society through shared group expression. Participation in a group intervention aimed at increasing residents' consumption of water showed an increase in residents' perceived social support, as well as an improvement in overall health due to increased consumption of water (Gleibs et al., 2011). This improvement in social support may be attributed to the groups meeting on a regular basis.

Haslam et al. (2010) used group based interventions to show that residents' well-being and cognitive performance can be improved through social group membership. Haslam et al. argued that the group based activities such as reminiscence therapy, have an advantage when compared to the same activity performed alone. Group based activities are more likely to foster a sense of shared social identity. The results supported this finding as only group-based interventions showed improvements in cognition and well-being, when compared to the same activity performed alone (Haslam et al., 2010). Men can be particularly marginalised in residential care due to their lower numbers and difficulties accessing social support networks. For men, engagement in gender-based social groups such as a Gentleman's Club is beneficial (Gleibs et al., 2011). Reminiscence therapy has also been found to promote positive social interactions within homes by facilitating ongoing communication between residents about shared experiences and

culture (Jones, 2003)

Interventions in residential aged care aimed at decreasing the levels of depression in residents often involve interactions with others. For example, participation in gardening activities with other residents can decrease depressive symptoms, improve life satisfaction, and improve perceived social support (Cummings, 2003). Depression may also be decreased through engagement with interventions by the incidental enhancement of social support networks. This has been supported by Choi et al. (2008) who conducted in-depth qualitative interviews with aged care residents regarding preferred depression treatment. Residents indicated that they preferred programs that reduced isolation. This was compared to group or individual psychotherapy aimed specifically at reducing depression (Choi et al., 2008).

Engaging in physical activity can counteract the negative effects of deteriorating health and negative life events, such as the relocation to an residential facility (Harris, Cronkite, & Moos, 2006). Participating in physical activities on a regular basis can increase physical health, and in turn, lower levels of depression. Leisure activities that are productive and valued by society also reduce depression by enhancing a sense of agency (Herzog, Franks, Markus, & Holmberg, 1998). Activities that are productive include housework, upkeep of the home, or helping others in a way that has social or economic value. These types of activities maintain a self-identity of usefulness and competence (Herzog et al., 1998). Aged care residents may not be engaging in enough physical or productive activities to act as a protective buffer for depression due to resident's high need for physical care within the restrictive environment of aged care.

Participation in physical activity groups can also protect against the negative outcomes associated with low levels of social support. Participation in physical activities can enhance the well-being of older adults, not just due to the physical activities

themselves, but by the sense of belonging achieved through active participation in a group (Mock, Fraser, Knutson, & Prier, 2010). McHugh and Lawler (2012) found that exercise is protective against the negative outcomes of low levels of social support in community dwelling older adults. This was also supported by Kwag, Martin, Russell, Franke, and Kohut (2011) who found that social support and physical activity mediated the relationship between stress, fatigue, and loneliness in older adults. Engagement in physical exercise may also have an antidepressant effect on older adults (Biddle, Fox, & Boutcher, 2002).

Exercise has been found to be more effective in reducing depression symptoms in older adults when compared to a health education program (Mather et al., 2002). Participation in an exercise program has been found to reduce symptoms of minor depression in older adults (Barbour & Blumenthal, 2005). This reduction was found to be similar to residents who were provided with anti-depressant medication, however participation in an exercise program also provided an improvement in physical functioning. Participation in an exercise program also reduced depressive symptoms in aged care residents with Alzheimer disease (Williams & Tappen, 2008). Improvement in depression symptomology may occur due to the incidental socialising that happens during exercise and leisure activities or improvements in self-esteem (Barbour & Blumenthal, 2005, McHugh & Lawlor, 2012).

Due to the varying degrees of cognitive functioning and physical limitations that the older adults in care experience, play therapy interventions enable older adults of all abilities to express themselves in a novel manner (Ledyard, 1999). A play environment may allow older adults to be understood and to express emotions, thoughts, or experiences that may be concealed (Ledyard, 1999). Play therapy gives the residents a wide range of toys to express their feelings or explore real-life experiences such as a

medical kit. Ledyard (1999) conducted research with aged care residents where they were engaged in play therapy under the supervision of a trained therapist. The therapist met with residents twice a week, for 10 sessions. At the end of the sessions residents were more engaged with other residents, and also were able to freely express previously repressed feelings (Ledyard, 1999)

In summary, there is evidence that participation in interventions aimed at decreasing depression, increasing physical activity, encouraging play, and increasing cognitive ability can improve the overall well-being of older adults in residential facilities. Some of the improvements in quality of life can be attributed to incidental increases in a sense of shared social identity within the aged care facility. Recent advances in technology present older adults in aged care facilities with new and innovative ways to improve their well-being. One of these is the introduction of computer games to improve well-being and facilitate meaningful social interactions.

Gaming

Video games can provide older adults with a number of physical and mental health benefits. First generation computer games were used with older adults as early as 1983. Weisman (1983) trialled the use of four computer games with aged care residents. This research identified that after initial hesitation, residents learned to play the games and enjoyed the novel stimulation the game play provided. The first experimental study to investigate the use of video games with older adults in residential care used an Atari 2600 equipped with Breakout, Space Invaders, Pac Man, bowling, and football (McGuire, 1984). The video games were made available to residents over 8 weeks. By the end of 8 weeks, residents who played the games showed improvement in their self-esteem and quality of life compared to residents who did not have access to the games. In another early study, Goldstein et al. (1997) utilised the video game Super Tetris with community

dwelling older adults aged 69 to 90 years. It was found that playing video games increased self-reported well-being when compared to the control group. Older adults also showed improvements in response time after playing Pac Man and Donkey Kong (Clark, Lanphear, & Riddick, 1987).

As computer and console game technology has advanced, so has the different functions and uses of computer games. Digital games are not just used for fun and entertainment. The term “serious games” has been used to identify games used for purposes such as education, training, advertising, research, and health promotion (Wiemeyer & Kliem, 2012). Recently, games have been developed that also incorporate the use of the whole body. These games have been termed “exergames” as they can improve health, physical fitness, and coordination through the combination of physical activity and game play (Wiemeyer & Kliem, 2012).

Exergames are an accessible gaming option for older adults in care. Ulbrecht, Wagner, and Gräßel (2012) showed that aged care residents are able to actively engage with and play exergames with no adverse side effects. This includes residents with mild to moderate dementia. The residents who engaged with the game play were likely to be younger, have less cognitive impairment, and more interested in hobbies (Ulbrecht, Wagner, & Grässel, 2012). Older adults in the community and in care may benefit from the use of new and engaging digital games, however the process of aging may discourage their use.

Older adults can become out of touch with new technologies, and this applies to digital computer games. Older adults can be concerned about the challenge of learning new skills, and may not perceive themselves as gamers, which can prevent new skills being learnt (Nap, IJsselsteijn, & de Kort, 2009). Older adults can, however, learn to use computers (Kiel, 2005). They can also benefit from their use as they can provide new

ways to stay socially connected and informed about current events (Kiel, 2005). De Schutter and Abeele (2010) have identified three factors that facilitate acceptance of digital games and can help attribute meaning to game play in the elderly. Firstly, games should be perceived as fostering a sense of connection with other players, with friends or family. Secondly, games should encourage learning and growth through play. Lastly, games should also enable the user to contribute to society through good deeds (De Shutter & Abeele, 2010).

The development of exergames enables the player to be both physically and cognitively involved in the gameplay. A systematic review of the physical and cognitive effects of playing physically interactive computer games was conducted (Bleakley et al., 2013). This review was restricted to the use of computer games with the elderly. Across 12 studies it was found that interactive computer games were safe and were an effective way to increase physical activity in older adults. The use of the computer games was also associated with improvements in a range of physical and cognitive outcomes. In this review there were no reported adverse physical side effects.

Nintendo Wii. The Nintendo Wii was one of the first commercially available interactive exergames to be used with older adults. The Wii was released in 2006 as a home video game console and utilises a wireless controller (the Wii remote). This controller can be used as a hand held pointing device. The Wii remote is motion sensitive and incorporates 3-dimensional accelerometer technology that can respond to changes in direction, speed, and acceleration (Nintendo Australia, 2013). The Wii is able to track spatial movements and incorporate this in real time into game play (Lawrence, Sax, Navarro, & Qiao, 2010). Therefore, to play the Wii the player has to physically move the remote to control the game play on the screen. The Wii enables older adults to play familiar games that replicate sports and activities in real life, such a bowling, golf,

boxing, and skiing. The Wii is attractive to a diverse range of people due to ease of using the hand held Wii remote and the familiarity of the game play (Lawrence et al., 2010).

The cost effectiveness of commercial systems such as the Wii make this a feasible option for residential facilities (Cyarto, Kuys, Henwood, & Blackberry, 2011). Marston (2013) found that the Wii console was easier for older adults to use when compared to other more traditional digital games, due to the ability of the remote to track special movements. Neufeldt (2009) found that older adults were able to play the Wii with simple modifications to the remote and playing environment such as playing while seated. The Wii, along with other video and computer games, has been used with older adults to improve cognitive functioning, facilitate rehabilitation, increase physical fitness, and improve mental health.

Cognition. Video games require the participant to exercise control, concentration, and manual dexterity to be successful. As the games progress, they often become harder, requiring the player to improve on a previously learnt skills. The process of playing computer games can help stimulate the normal functions of the nervous system in older adults due to the game's complexity (Gamberini et al., 2008). Gaming systems have been designed for use with older adults with existing cognitive impairment. These systems have graded levels of difficulty that can help train and improve cognitive functioning (Brasil et al., 2013). In other studies, computer games have been modified to allow monitoring of the aged care residents while playing the computer games. Monitoring can identify early cognitive decline through systematic changes in performance (Jimison, Pavel, McKanna, & Pavel, 2004). Aged care residents have also shown cognitive improvement, increased mental stimulation, and increased self-esteem when using a bulletin board style computer system (McConatha, McConatha, & Dermigny, 1994). These systems are, however, not readily available commercially or have become outdated

technology due to the widespread use of the internet.

The use of the Wii has been shown to improve executive control and processing speed in older adults when compared to a control group (Maillot, Perrot, & Hartley, 2012). Participants showed improvements in functional abilities related to everyday living. This is thought to be due to the combination of physical activity and engaging game play (Maillot et al., 2012). Ackerman, Kanfer, and Calderwood (2010) have found that when using the "Big Brain Academy" software for the Wii, older adults showed improvement on the tasks required of the game. There was, however, no transfer of abilities to cognitive or perceptual speed when assessed outside of the game play, probably as a result of the practise effect of playing the game. Although there are mixed results regarding the level of cognitive improvement older adults experience from playing the Wii, numerous studies have found the Wii to be an effective rehabilitation and physical fitness tool.

Physical health and rehabilitation. The Wii has been widely used and is increasingly popular as a tool for rehabilitation, to increase fitness, and increase physical health. The Wii has been shown to be appropriate for use with older adults with no physical adverse effects, including those with dementia (Kirk, MacMillan, Rice, & Carmichael, 2013; Ulbrecht et al., 2012). In Australia, 76% of stroke rehabilitation facilities have a Wii for use as part of the rehabilitation program (National Stroke Foundation, 2013). The mental training involved in using the Wii is a feasible and effective way to improve motor skills after a stroke (Gaggioli, Meneghini, Morganti, Alcaniz, & Riva, 2006). Video games are used in rehabilitation as the games can be enjoyable and help to focus attention away from the potential discomfort involved in rehabilitation (Griffiths, 2005).

The Wii has been introduced into residential care facilities to facilitate

improvement in a range of physical health related factors. Chao, Scherer, Wu, Luke, and Mongomery (2013) instructed aged care residents to play the Wii twice a week, for 8 weeks. Over the 8 weeks there were improvements in balance, mobility, walking endurance, and a decreased fear of falling. All participants enjoyed playing the games, and no serious side effects were reported. In a 6 week intervention, aged care residents played Wii bowling for twenty minutes, twice a week (Sohnsmeyer, Gilbrich, & Weisser, 2010). At the end of the intervention, participants showed increased muscle strength when compared to a control group. Maillor et al. (2012) found that participants who played the physically engaging sports games on the Wii showed cognitive improvements and an overall improvement in physical skills. Besides the contribution to physical health, interactive games such as the Wii can help older adults improve their mental health and psychological well-being.

Depression. The Wii has been shown to be of benefit to older adults who are suffering from subclinical depression. Rosenberg et al. (2010) conducted a pilot study with 19 community living older adults with subclinical depression. The participants played Wii Sports 3 times a week, for 3 months. At the end of 3 months, levels of depression decreased and there was an increase in reported quality of life. Depression scores had also improved at follow up (20 - 24 weeks). There were no major adverse effects reported due to game play. Rosenberg et al. concluded that the Wii was a novel way to reduce depression in older adults, however further controlled trials were required.

Wii has also been shown to reduce depression in aged care residents. Homma (2009) recruited 12 aged care residents to play Wii alone, over 6 weeks. Participants' mean depression score reduced, but not significantly over the period of the research. This research did not utilise a control group, preventing a comparison with residents who were not participating in an intervention program. Additionally, none of the participants in this

research were initially depressed. Participants did however, show improvement in their concentration and confidence during this research (Homma, 2009).

Social engagement. Videogames can help promote social engagement and well-being in older adults through shared, enjoyable interactions. Learning to use digital games can help bridge the gap between the older and younger generations. A longitudinal study conducted by Chua, Jung, Lwin, and Theng (2013) recruited youths and older adults to play Wii together over 2 months. At the end of 2 months, youth perceptions of older adults had positively changed, there was greater attraction to their partner and intergroup anxiety had decreased. The enjoyment of the game played an important role in developing positive perceptions of older adults (Chua et al., 2013). This has been supported by Keogh, Power, Wooler, Lucas, and Whatman (2012) who found that after the initial fear of learning a new skill, residents would challenge their grandchildren to competitions on the Wii when they visited.

Harley, Fitzpatrick, Axelrod, White, and McAllister (2010) established a Wii bowling league in a community housing scheme for older people. Playing Wii helped to address social isolation in the elderly by providing them with the opportunity to form new social relationships. New roles were also established as the older adults could act as a host or organiser of each tournament, which in turn helped to empower older adults with a sense of mastery (Harley et al., 2010). The social aspect of the Wii game play is also evident even when the intervention is aimed at increasing physical activity. Playing Wii in the company of other people gave the elderly an opportunity to interact, encourage, and enjoy each other’s company (Summey, 2009). Participants playing the Wii were able to bond and get to know other people in their community due to the shared experience of game play (Wollersheim et al., 2010).

The use of digital games can increase engagement with activities within

residential care facilities, however the research in this area is limited. For care residents, the most important predictor of time spent playing digital games was social interaction (Schutter, 2010). Focus groups with aged care residents have revealed that they enjoyed the competition and cooperation that multi-player Wii games require (Gerling & Masuch, 2011). Participants indicated that the game play was discussed with other residents after the sessions had ended, and participants playfully mocked residents who lost (Gerling & Masuch, 2011). The game however, was found to be unsuitable for some frail elderly due to the sometimes complex design of the Wii games (Gerling & Masuch, 2011).

In Australia, telephone interviews were conducted to ascertain staff perceptions of using the Wii as an activity (Cyarto et al., 2011). The staff worked in Victoria, New South Wales, and Queensland in community day centres or respite programs that had been using Wii with their residents. Staff reported greater interaction between the participants. The game play also encouraged participants to get to know people they did not know previously. This research showed that playing the Wii is able to increase social interaction between residents, and also engagement with staff. Wii bowling was found to be the most popular game and the easiest for older adults to learn (Cyarto et al., 2011). Playing the Wii has also been found to improve resident's engagement in social activities within an aged care facility. Keogh et al. (2012) found that residents who had started to become reclusive enjoyed participating in Wii games, developed friendly relationships with other residents, and were enthusiastic about future sessions.

To establish the effect of playing the Wii with residents in an aged care facility, Higgins, Horton, Hodgkinson, and Muggleton (2010) conducted in-depth interviews with staff. The homes selected were all currently using the Wii. In this research, a number of different benefits were established. The staff indicated that the use of the Wii had encouraged more social interactions between residents. One resident, who had previously

not participated in group activities, had embraced the use of the Wii. The mastery of the new technology had also improved residents' self-esteem and confidence. Also, due to the Wii games being similar to real life past times, some residents embraced the opportunity to play games they could no longer manage in real life, such as golf. Overall, it was reported that playing the Wii helped to foster a sense of community and belonging due to the opportunity to socialise and learn new skills as a group.

Higgins et al.'s (2010) study presents a number of methodological limitations. The research did not experimentally control the amount of time each resident could use the Wii. This prevents accurate assessment of how long residents actually played the game and socialised. The outcome of participation was only measured by conducting interviews with staff. The residents were not interviewed. Research shows that staff and residents can have quite different perspectives on the effectiveness of participation in activities (Knight & Mellor, 2007).

Only a few studies have systematically measured the effects of playing the Wii on the well-being of residents. Wittelsberger, Krug, Tittlebach, and Bös (2012) conducted research with 27 aged care residents. Residents were asked to play the Wii twice a week, for 6 weeks with other residents. The effect of the Wii on daily living, dementia status, quality of life, cognition, and motor skills of residents was investigated. In the areas of daily living, dementia, and quality of life, no significant changes over time were found. In this research, each session lasted up to one hour, however each resident only had an average playing time of 8.5 minutes per session. This may have reduced the potential effects of playing the Wii as the playing time for each resident was low. The participants may not have become comfortable with the game play due to the limited playing time per session, which may in turn have inhibited meaningful social relationships from forming. Wittelsberger et al. (2012) also acknowledge that the brevity of the intervention phase and

the large difference in age of the participants could have affected the outcome of the study.

Kahlbaugh, Sperandio, Carlson, and Hauselt (2011) investigated the effects of playing the Wii on physical activity, loneliness, and mood using older adults in a residential facility. A sample of 36 residents participated in the research (4 men and 32 women). Residents were asked to either play Wii games of their choice or watch television with a social partner for one hour a week, over a period of 10 weeks. The social partner was a female undergraduate research student. The research assistants were encouraged to be socially responsive to their older partners. This research also had a control group of seven residents who did not participate but were included to control for any effects associated with being in a research study that involved visits to administer questionnaires. This group served as a base line. It was found that the group playing Wii had a decrease in loneliness whereas the group watching television have an increase in loneliness by the end of week 10. There was no change in mood or physical activity over the 10 weeks, however each week there was an increase in weekly reported mood for the group playing Wii when comparted to the control group.

Kahlbaugh et al.'s (2011) research shows that the Wii as an intervention is able to have a positive impact on the well-being of older adults in aged care facilities, however there were a number of methodological limitations. This research only involved four male residents, and all of the research students were female. The use of only female research students may have reduced the effectiveness of the intervention. For men, engagement in a social group with the same sex is especially beneficial due to the predominantly female nature of aged care homes (Gleibs et al., 2011). The research used students as the social partner. This may have significantly reduced the beneficial effects of playing the Wii with others. The residents would be aware that the students are only going to visit for the

duration of the research as part of their studies, and are not going to continue contact at the end of the research. This does not allow for long term bonds to form with other residents within the home. The formation of friendships with other residents in the home encourages social groups and meaningful social interactions to form. The formation of temporary social relationships with research students from outside the home would not provide any of the protective factors of social group membership to the residents (Park et al., 2012).

Recently, Keogh et al. (2014) conducted a study with residential care residents to assess the potential benefit of having a Wii available for an 8 week period. Residents were assessed on their levels of functional ability, physical activity, and quality of life. Residents in the Wii group were compared to a control group who did not participate. Semi structured interviews were also conducted with residents at the conclusion of the research. There was no significant differences found between the two groups, however moderate effect size differences were found for functional ability, physical health, and social relationships. Thematic analyses of the semi-structured group interviews indicated that the residents felt there were a number of positive outcomes such as feeling good/silly, having fun, and looked forward to playing the Wii.

Keogh et al. (2014) reported that the most important theme to emerge from their study is the increased and enhanced social interaction, both when playing the game and when watching others. This change in social interaction did not, however, result in a significant improvement in the domain of social support as assessed by the World Health Organisation Quality of Life Questionnaire – Brief Australian Version. Keogh et al. suggests further research in this area is required.

Only one study appears to have investigated the use of the Wii to improve well-being in residential care residents through social interaction with other residents. Koay,

Ng, and Wong (2009) investigated the effect of playing the Wii with others and alone. A 6 week intervention was conducted at an aged care facility in Singapore. A sample of 45 residents participated in the research. Participants were divided into three groups, playing Wii with others, playing Wii alone, and a control group who played board games with each other. Residents played the Wii 3 times a week, for 90 minutes. At the beginning and the end of the 6 weeks, participants completed measures of social interaction, physical activity, senior centre belonging, loneliness, affect, and self-esteem. At the conclusion of the research, the residents in the Wii conditions scored significantly higher on self-esteem, physical activity and affect, and significantly lower on loneliness when compared to the control group. No difference was found between the groups playing Wii alone and with others (Koay et al., 2009).

The lack of difference between the two Wii conditions in Koay et al.'s (2009) research could be attributed to social interaction taking place in both conditions. When the participants were playing Wii alone, all the other members of that condition were in the room. The other group members were actively engaged in the game play through comments and encouragement about game play. As the other group members were in the room, the participants could not be said to be truly playing the game alone. The control group also engaged in social interactions with each other as they were playing board games together. The residents of the facilities also spoke a range of dialects such as English, Hokkien, Cantonese, and Malay. Language barriers between the residents could have prevented meaningful social interactions from occurring within the home. The residents in this research may also not have been provided with the opportunity to benefit from playing the Wii due to the demands placed on them by the research. The residents were asked to play 3 times a week, for 90 minutes each session. They were also given the choice of five different games to play on the Wii. This research schedule may have been

overwhelming for residents. Overall, although this research showed that playing the Wii is an effective intervention to increase well-being in older adults residing in residential care, however, methodological issues prevent generalisation of results.

Current Study

To the researcher's knowledge no previous research has systematically measured the effects of playing the Wii with aged care residents in a western culture using a wait list control group. Kahlbaugh et al.'s (2011) research utilised female research assistants as the gaming partner, which did not allow for social relationships to form between residents within the age care facility. Participants in Wittelsberger et al.'s (2012) research had limited access to the Wii, the research had a short intervention phase, and there was a large difference in the age range of the participants. All of these factors could have limited the generalisability of this study. Residents participating in the control group in Koay et al.'s (2009) study were playing board games together which may have influenced outcome measures. No previous study has systematically measured the effect of using the Wii on depression, sense of belonging, social support, and social interaction. Depression is a significant issue for resident's well-being along with a lack of social support and belonging within aged care facilities. Further, no study has utilised a control group to test the use of the Wii console in aged care facilities measuring depression, social support, and a sense of belonging as the outcome measures.

The aim of the current research was to investigate the mental health of Australian aged care residents who participate in a group activity involving playing the Wii compared to a control group. Nursing staff and resident feedback on the feasibility and enjoyment of the Wii was also investigated. Detailed notes about the feasibility of using the Wii with residents were taken in week 1, 3, and 6. Staff and residents' opinions on the feasibility, ease of use, and enjoyment of the Wii console were also obtained at the end of

the 6 week intervention. The level of interaction between residents was expected to increase through shared social interaction. Playing the Wii was expected to improve residents' overall well-being through a decrease in levels of depression and an increase in sense of belonging, mood, social support, and an increase in social interaction.

Consistent with previous research, it was hypothesised that using the Wii would improve residents' mood, lower levels of depression, increase social support, and increase the residents' sense of belonging within the aged care facility. It was hypothesised that the group playing Wii with other residents would show an improvement on all factors when compared to the control group. The participants who were playing Wii were also involved in an interval interaction analysis. This was done by analysing notes taken at the Wii sessions in week 1, 3, and 6. It was hypothesised that over the time period, participants playing Wii would have an increase in positive group social interactions.

Method

Participants

Initially 44 older adults volunteered to participate in the study. Five participants were excluded due to insufficient data (N = 39). In these cases insufficient data was due to worsening health concerns or the death of a close family member which prohibited continuation in the study past week 1. The resulting sample consisted of 22 residents in the intervention group and 17 residents in the control group. This sample was used in all subsequent data analyses.

Participants were aged from 65 to 95 years old (*Mean age* = 84, *Median age* = 87, SD = 8.49). There were 8 men (20.5%) and 31 women (79.5%). The mean number of months in care was 31.64 (SD = 24.41) with a range of 2 to 96 months. The participants were recruited from four different residential care homes. These homes were selected as they had more than 12 residents classified as low care who were able to take part in the

research. The facilities were all located in rural or metropolitan areas in the state of Victoria, Australia.

Participants were screened before the commencement of the intervention to ensure they were able to be safely and meaningfully involved in the research. The screening questionnaire asked participants to indicate if they suffered from any of the following impairments: severe cognitive impairment, diagnosis of bipolar affective disorder, schizophrenia, intellectual disability, severe hearing impairment, acute illness, inability to communicate in English due to non-English speaking background, age of less than 65 years, epilepsy or seizures, pacemaker, implanted medical device, or physical disability preventing use of the Wii console. These questions were based on previous research and on the safety precautions provided in the instruction manual from the Wii (Davison et al., 2007). No residents were excluded from either the control or the intervention group due to the above exclusion criteria.

The intervention group playing Wii consisted of 22 older adults, aged from 65 to 95 years old (*Mean age* = 85.68, *Median age* = 90, *SD* = 9.62). The length of time spent in residential care varied from 2 to 96 months (*Mean time* = 30.73, *Median time* = 26.5, *SD* = 24.34).

The control group consisted of 17 older adults aged from 65 to 95 years old (*Mean age* = 84.82, *Median age* = 84, *SD* = 7.02). The length of time spent in residential care varied from 7 to 95 months (*Mean time* = 32.76, *Median time* = 26, *SD* = 25.20). Table 1 presents the demographic information on gender, relationship status, and education for each group. As can be seen in Table 1, the majority of the participants in both the intervention and control group were widowed women. About half of the participants in both groups had completed secondary school.

Table 1

Demographic Information

		Intervention		Control	
		n	*%*	*n*	*%*
Gender	Male	6	27.3	2	11.8
	Female	16	72.7	15	88.2
Relationship Status	Single	2	9.1	0	0
	Married/partnered	3	13.6	3	17.6
	Divorced/separated	1	4.5	4	23.5
	Widowed	16	72.7	10	58.8
Education	Primary school	4	18.2	4	23.5
	Secondary school	10	45.5	8	47.1
	TAFE/trade certificate	5	22.7	5	29.4
	Undergraduate degree	3	13.6	0	0
	Postgraduate degree	0	0	0	0

Materials

A Plain Language and Information Statement (Appendix A: Wii intervention group, Appendix B: Control group) was provided to participants along with a consent form (Appendix C: Wii intervention group, Appendix D: Control group). The Plain Language and Information Statement outlined the purpose of the research and what participants would be asked to do if they agreed to participate. This statement also clearly stated that participation in no way affected the level of care they currently received. The Plain

Language and Information Statement contained contact information for staff at Federation University Australia as well as telephone numbers participants could contact if they felt distressed any time during the research.

Demographic information. The demographic information section included questions on participant's age, gender, date of admission to the home, education level, relationship status, and perceived health status (Appendix F: Demographics). Perceived health status was measured with a single item question "What is your perceived health status?" (1 = *very poor*, 2 = *poor*, 3 = *average*, 4 = *good*, 5 = *very good*).

Dementia. Participants' level of cognitive impairment was measured using the Veterans Affairs Saint Louis University Mental Status Exam (SLUMS; Tariq, Tumosa, Chibnall, Perry, & Morley, 2006; Appendix E). The SLUMS exam is an 11-item scale measuring both dementia symptomatology and mild cognitive impairment in the domains of orientation, memory, attention, and executive functions (Tariq et al., 2006). The SLUMS exam takes approximately 7 minutes to complete one on one with the resident. Scores on the SLUMS exam can range from 0-30. Mild cognitive impairment is defined as a SLUMS score of 20-27 for participants with a high-school education and above or a score of 15-19 for participants with less than high-school education. Scores of 1-19 for those with high school education, and 1-14 for those with less than high school education indicate severe cognitive impairment or dementia. For this research, participants were excluded if they received a score of 20 or less on the scale indicating the presence of dementia or severe cognitive impairment (Feliciano et al., 2012).

To establish concurrent validity, the SLUMS exam and the Mini Mental Status Examination have been previously administered to 705 men who were at least 60 years old (Tariq et al., 2006). It was found that both the Mini Mental Status Examination and the SLUMS exam were able to detect dementia, however the SLUMS exam was also able

to detect mild cognitive impairments in this sample (Tariq et al., 2006). The SLUMS exam is also able to predict mortality and aged care admission over a 7 year period (Cruz-Oliver, Malmstrom, Allen, Tumosa, & Morley, 2012).

Depression. Participants' levels of depression symptomology were measured using the Geriatric Depression Scale Short Form (GDS -SF, Yesavage & Sheikh, 1986, Appendix G). This scale was specifically developed for use with older adults. The scale utilises a simple *yes/no* format for ease of administration. The GDS-SF consists of 15 items which assess symptoms that are associated with depression in older adults (e.g., Do you often feel helpless?). Higher scores indicate higher levels of depressive symptomatology in an individual. A cut off score of 7 or more was used for this research as it has been found to be the best overall score to indicate depression in older adults (Lesher & Berryhill, 1994). This was established by comparing older adult's symptoms of depression as assessed by the criteria outlined in the DSM-II-R and the results of the GDS-SF.

The GDS-SF has been found to be a good indicator of depression in residential care populations. Baker and Miller (1991) assessed 80 aged care facility residents for depression using the GDS-SF. If participants were found to have depressive symptoms they were referred for evaluation by a trained professional. Of those identified by the GFS-SF, 54% were found to have a DSM-III-R diagnosis with either Major Depressive disorder or an adjustment disorder with depressed mood (Baker & Miller, 1991). The shorter version is able to differentiate depressed from non-depressed older adults, and has a significant correlation with the original 30 item scale ($r = .84$, $p < .001$; Yesavage & Sheikh, 1986). Parmelee, Powell, and Katz (1989) have found in a study of 417 aged care facility residents that the GDS-SF has concurrent validity with the DSM-III-R criteria of depression in 73% of cases. In both cognitively impaired and non-impaired residents, the

test-retest reliability of the GDS-SF over one year was r = .86 (Parmelee et al., 1989). The GDS-SF has been found to be able to detect mild depression in elderly psychiatric in-patients, with α =.91 (Lesher & Berryhill, 1994). In a sample of 401 African American adults aged 51 and over, the GDS-SF demonstrated good internal consistency (r =.71; Pedraza, Dotson, Willis, Graff-Radford, & Lucas, 2009).

Cronbach's alpha for the intervention sample was α = .70 which shows good internal consistency, and Cronbach's alpha for this control sample was α = .69 which shows acceptable internal consistency.

Social support. Participants' reported level of social support was measured using the Social Provisions Scale (Curtrona & Russell, 1987; Appendix H: Social Provisions Scale). The Social Provisions Scale was designed to examine the degree to which respondent's social relationships provide social support to the individual. The scale consists of 24 items measuring six subscales: attachment, social integration, reassurance of worth, reliability, alliance, guidance, and opportunity for nurturance. The six subscales are based on provisions initially identified by Weiss (1974). The participants indicated on a 4-point scale the extent to which each statement describes their current social support. Responses ranged from strongly disagree to strongly agree (1 = *strongly disagree*, 2 = *disagree*, 3 = *agree* to 4 = *strongly agree*). Half of the items describe the presence of a type of support (e.g., There are people who enjoy the same social activities I do) and the other half describe the absence of a type of support (e.g., There is no one I can turn to for guidance in times of stress). Higher scores indicate greater levels of social support.

The Social Provisions scale has discriminant validity with social desirability, depression, introversion-extroversion, neuroticism, and stress (Cutrona & Russell, 1987). This scale was not designed for use with older adults, however Cutrona, Russell, and Rose (1984) have tested this scale with approximately 100 elderly participants and found

it to be reliable, α = .70. The Social Provisions Scale's reliability has also been tested in a number of different populations such as psychology students, teachers, and nurses. Cutrona and Russell (1987) report coefficient alphas ranging between .65 to .70 and test-retest reliability coefficient ranging from .37 to .66 over a 2 week period. The scale shows good internal consistency across all sub-sections of the scale (α =.70). Cronbach's alpha for the intervention sample was α = .87 which indicates good internal consistency, Cronbach's alpha for the control group was α = .42 which indicates unacceptable internal consistency.

Sense of belonging. To measure sense of belonging in older adults, a visual analogue scale was utilised. The Sense of Belonging Visual Analogue Scale (Appendix I) was developed by Morris (2010). The Sense of Belonging Visual Analogue Scale was developed to enable the 18-item Sense of Belonging Instrument (Hagerty & Patusky, 1995) to be reduced to a two item visual analogue scale for ease of use. The Sense of Belonging Visual Analogue Scale measures the two theoretical concepts underlying the Sense of Belonging Instrument as proposed by Hagerty and Patusky (1995); these concepts are how much someone feels valued, and their fit with the surrounding environment.

The Sense of Belonging Visual Analogue Scale presents participants with two 10cm lines. At each end of the line opposing statements are placed. The Sense of Belonging Visual Analogue Scale measures how valued someone feels, the extreme positions of the line had the statements "Not valued at all" to "Completely valued". The Sense of Belonging Visual Analogue Scale also measures participant's feelings of fit with their environment, the extreme positions of the line had the statements "Not fit in at all" to "Completely fit in". Respondents were asked to place a vertical line indicating the extent to which they endorsed the concepts on either extreme. The placement of the line

was measured in centimeters, and rounded to the closest centimeter. Higher scores indicated greater levels of each concept.

The validity of the Sense of Belonging Visual Analogue Scale has been established by Morris (2010). The scores obtained on the visual analogue scales measuring the psychological concepts of fit and value were combined. This score was correlated with scores obtained on the psychological state sub-scale of the Sense of Belonging Instrument (Hagerty & Patusky, 1995). The Sense of Belonging Instrument is a valid and reliable measure of sense of belonging. The scale has high internal consistency (α =.93) and a test-retest reliability of α = .84 over a 8 week period (Hagerty & Patusky, 1995). There was a significant, strong positive correlation between the Sense of Belonging Visual Analogue Scale and the Sense of Belong Instrument (*rho* = .67, $p <$ .001; Morris, 2010). This shows that the two-item visual analogue scale is an accurate measure of sense of belonging. This scale has not been validated with older adults.

Mood. Participant's mood was measured using a visual analogue mood scale (Appendix J: Mood visual analogue scale). The visual analogue mood scale was a 10cm long line. Participants were asked to indicate "How is your mood right now?". The extreme positions had the statements "worst mood" and "best mood". This scale was scored in the same way as the Sense of Belonging Visual Analogue Scale, with higher scores indicating better mood.

Post-intervention evaluation. Evaluation of the research was conducted using a short answer questionnaire at the end of the intervention (Appendix K: Post intervention evaluation questionnaire). This questionnaire was written specifically for this research to enable participants to provide more in depth information about their experience of playing the Wii. The questionnaire asked participants questions such as "What was good about playing the Wii?". "Would you prefer to play the Wii with others?", "What was bad about

playing the Wii" and "Would you prefer the sessions to be longer or shorter?". The responses to these questions were provided by the participants in a hand written short answer format. For those participants who could not easily write, questions were read out verbatim and responses were transcribed by the researcher.

Procedure

In the current research, the Wii was selected as it is easily accessible to older populations, due to the relevance of the game to an actual sport, its cost effectiveness, and is availability in the commercial marketplace. The Wii console incorporates the factors identified by De Schutter and Abeele (2010) that facilitate acceptance of digital games and help attribute meaning to game play in older adults. The Wii bowling game was used in this study as this has been found to be the most popular and easiest for older adults to learn (Cyarto et al., 2011).

This research was conducted over 12 months between November 2013 and November 2014. Approval was gained from Federation University Australia's Human Research Ethics Committee before commencement of the research (approval number: A13-078). The trial was also registered with the Australian New Zealand Clinical Trials Registry: ACTRN12611000700932. Participants were sought from four residential care homes in the state of Victoria, Australia. Two of the facilities were located in regional towns and two of the facilities were located in Melbourne. Potential residential care facilities were contacted and provided with an outline of what participation in the research would involve for residents. A total of 18 facilities or organisations were contacted, resulting in a response rate of 22%. The researcher gained written permission from each care home that was attended. All equipment used for the research (television, Wii console, games, and remotes) were supplied to the home by Federation University Australia. At the commencement of the research, a short presentation to inform potential participants was

given at each of the facilities during morning or afternoon tea, or during a resident get together such as afternoon drinks. Potential participants were able to ask questions and clarify what participation in the project would involve for them.. Interested participants were given a Plain Language Information Statement and a consent form to read. Some residents were also approached individually by the researcher on the recommendation of nursing staff in the facility.

As per the National Statement on Ethical Conduct in Human Research (National Health and Medical Research Council, 2007), participants were then given 1 week to decide if they would like to participate. Potential participants were encouraged to discuss their participation with family/friends who were able to support them in the decision making process. Participants were able indicate if they would like to participate after 1 week by returning the consent form. It was clearly outlined to residents that participation in the study in no way affected the care they currently received in the home, and that they were free to withdraw from the study at any time. Figure 1 presents the flow chart of the method for the control and the intervention group.

Participants were randomly allocated to either the intervention or the control group based on their place of residence. Two homes were randomly allocated to each condition. If they wished to proceed, participants were individually asked to complete the screener questionnaire to indicate if they have any medical conditions which would deem them ineligible to participate. Participants were then administered the SLUMS exam individually by the researcher in a quiet, private section of the home. Participants who did not reach the minimum score of 20 were to be excluded from the study. No participants were excluded from the study at any point due to a medical condition or not reaching the minimum score on the SLUMS exam.

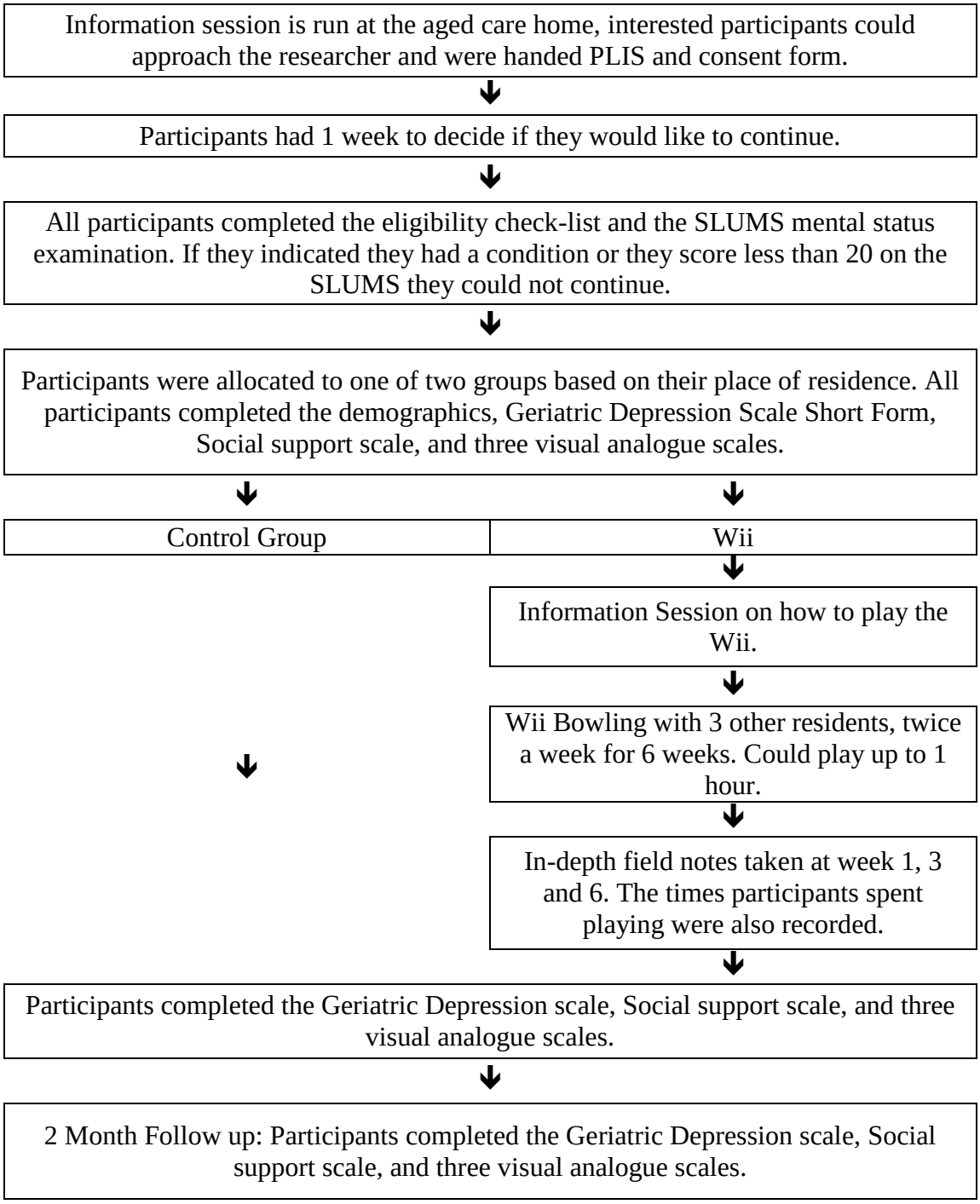

Figure 1. Flow chart of research method.

All participants who continued in the study were asked to complete the questionnaire package. This contained the demographics questionnaire, Geriatric Depression Scale Short Form, the Social Support Scale, and the three visual analogue scales to measure mood and sense of belonging. Participants were able to complete the questionnaire package one-on-one with the researcher to enable them to ask any questions

or clarify anything throughout the process. Some residents had difficulty writing, so the questions were read out verbatim by the researcher and responses transcribed. Residents in both conditions were assessed for depression, levels of social support, sense of belonging, and current mood at pre-intervention (0 week), post-intervention (6 weeks) and at 2-month follow up (14 weeks).

Wii. Participants were assigned to a time slot that suited their schedule and asked to play Wii bowling twice a week, for 6 weeks at their place of residence. Participants were asked to play the Wii with up to three other residents who were assigned to the same time slot. Participants were advised that the Wii sessions can last up to one hour, however participants were free to leave the session at any time during the hour. Residents were asked to play the Wii game while seated in a quiet area of the facility. The attendance and time spent playing was recorded. The researcher was on site for all sessions to address any technical difficulties. The researcher was not involved in the game play and did not interact with the residents unless there was a technical problem with the game play.

Participants in the intervention group playing Wii were also involved in a qualitative interval analysis. Field notes were taken at sessions run in week 1, 3, and 6. Field notes taken were used to record the interaction between group members to establish if over the period of the research positive interactions between group members increased. Field notes were then coded by the researcher and analysed using Nvivo 10. Field notes were then were analysed to establish the number of positive interactions between participants over time, the residents' opinions and reactions to playing Wii bowling, along with ease of use of the Wii system.

At the conclusion of 6 weeks, participants completed the questionnaire package again along with the post-intervention evaluation questionnaire. After 6 weeks the Wii console, television, and games were left at the residential care facilities for residents and

staff to use as often as they liked. Two months after the conclusion of the intervention period, participants were asked to complete the questionnaire package again along with a and a single item question to see if they had continued to use the Wii. A follow up after 2 months allowed pre-intervention scores to be compared with immediate post-intervention scores and follow-up scores to ascertain any changes in scores over time.

Control. Participants allocated to the control group were invited to participate in a study investigating social relationships and mood over time. Following the same timeline as the intervention group, participants were asked to complete the questionnaire package at three time points. All of the scales were completed at the beginning of the research, (0 week), after 6 weeks and at 2-month follow up (14 weeks) with the exception of the demographic information.

The control group were not asked to participate in any activities involving the Wii in the first 6 weeks. This is to ensure that any changes in mood in the control group could not be attributed to a research intervention. At the end of week 6 of research, the control group were provided with the Wii console and an appropriate television for use. This was provided to allow for residents in the control group to have access to the Wii within their place residence, following the same timeline as the intervention group. Nursing staff on site were provided with training on how to play Wii bowling. Staff were encouraged to include playing the Wii in recreational activities. This was provided to establish if residents and staff would start playing the Wii without the intervention of the researcher. After 2 months the control group was asked if they have started using the Wii after it was placed in the home.

Data Analyses

Sample size and power calculations. GPower (Faul, Erdfelder, Lang, & Buchner, 2007) analysis indicated that to detect a medium effect size (f (V) test = .25) with power

of at least .80 and an alpha level of .05, a sample size of 79 participants per condition was sufficient, assuming that all these participants completed all questionnaires and the intervention program. While the power analysis indicated a total sample size 158, this study was a pilot study to ascertain the feasibility of using the Wii console in a residential care facility. A sample size of 158 was not able to be obtained in the current study.

Quantitative analyses. The assumptions of normality, skew, kurtosis and multicollinerity were checked separately for the intervention and control group. Key descriptive measures were obtained. The intervention and control group were compared in terms of baseline measures for age, length of time in care, dementia status, and perceived heath status

To test the hypothesis that using the Wii would improve residents' mood, lower levels of depression, increase social support, and increase residents' sense of belonging within the residential care facility, a mixed model between groups multivariate analysis of variance was conducted using SPSS v20. This analysis was conducted to establish if there were any significant differences between the groups, and also to establish if there was any significant change over the three time periods (week 0, week 6 and week 14).

Qualitative analyses. The participants who played Wii were also involved in an interval interaction analysis. It was hypothesised that over the trial period, participants playing Wii with others would show an increasing number of positive group interactions as the intervention progressed. Staff and residents' opinions on the feasibility and usability of the Wii console were also obtained at the end of the 6 week research period using free response questions and informal interviews with staff members.

Positive group interactions were measured by an increase in social contact along with an increase in social interaction and enjoyment during the intervention sessions. Responses from staff and residents, along with the notes taken at week 1, 3 and 6 were

transcribed and analysed for key themes in conjunction with the qualitative interval analysis. Data were coded into key themes by the researcher. Nvivo 10 was used to analyse the data. The type and number of interactions between group's members at week 1, 3 and 6 were analysed to establish if there had been an increase in social interaction. Some of the questions required only a yes or no answer ("Would you continue to play Wii in the future?") and responses were coded as such. Responses to the post-intervention evaluation were analysed in conjunction with qualitative interval analysis conducted by the researcher.

Results

Quantitative Analyses

To establish if there was any significant differences between the intervention and the control group, between groups *t*-tests were conducted using the results obtained on the SLUMS exam, the residents' age, and the length of time in care. Table 2 presents the results of the between groups *t*-test of these variables, as well as means and standard deviations. As can be seen in Table 2, there were no significant differences between the control and intervention group for the SLUMS exam, age, and length of time in care.
A series of chi-square tests were run to establish if there was any relationship between groups and the demographic variables of relationships status, level of education, perceived health, and gender. The demographic variable of relationship status was coded into partnered (married) or unpartnered (single, divorced, or widowed). Level of education was coded into either primary/secondary school or TAFE/higher education. Perceived health status was coded into poor (very poor or poor), average, or good (good or very good). Variables were re-coded to ensure appropriate numbers in each cell for the statistical analyses.

Table 2

Between Groups t-test for SLUMS, Age, and Length of Time in Care

	Control		Intervention			
	M	*SD*	*M*	*SD*	*t*	*p*
SLUMS	23.88	2.39	23.14	1.52	1.19	.24
Age	84.82	7.02	85.68	9.63	-0.31	.76
Length of time in care (months)	32.80	25.26	30.73	24.34	.26	.80

Table 3 presents the results of the chi-square test for the variables of relationships status, level of education perceived health, and gender. As can be seen in Table 3, there was no significant relationship between group and the variables of relationship status, level of education, perceived health status or gender.

Table 3

Chi-square Test for Relationship Status, Level of Education, Perceived Health, and Gender

		Control		Intervention				
		n	*%*	*n*	*%*	*df*	χ^2	*p*
Relationship status	Partnered	3	17.3	3	13.6	1	0.19	.73
	Unpartnered	14	82.4	19	86.4			
Level of education	Primary/secondary school	12	70.6	14	63.6	1	0.21	.65
	TAFE/higher education	5	29.4	8	53.8			
Perceived health status	Poor	6	35.3	8	36.4	2	1.73	.42
	Average	9	52.9	8	36.4			
	Good	2	11.8	6	27.3			
Gender	Male	2	11.8	6	27.3	1	1.41	.23
	Female	15	88.2	16	72.7			

Table 4 presents the average number of sessions attended by the residents at each facility where the intervention was run, the average amount of time each resident spent playing the Wii, and the average length of the sessions.

Table 4

Time Spent Playing the Wii

	Facility 1	Facility 2	Mean
Sessions attended	80 %	62.12 %	71.06 %
Mean time spent playing	16 mins	15 mins	15.5 mins
Mean session length	72 mins	65 mins	68.5 mins

As can be seen in Table 4, residents attended an average of 71.06% of the sessions. The majority of residents missed sessions due to appointments with health professionals or visits from family or friends that coincided with session times. Approximately half of the residents in the intervention group indicated that they would continue to play the Wii in the future at the end of week 6 (47.06%). At the end of week 14, approximately a third (31.8%) of the participants in both intervention groups had continued to play the Wii. In the control group, 41.2% of residents had tried playing the Wii after it was introduced into the aged care facility at week 6.

Measures of depression, social support, sense of belonging, and mood were completed at the beginning of the research (0 week), post-intervention (6 weeks) and at 2-month follow up (14 weeks). Scales were considered to be skewed when greater than 2 and kurtosied when greater than 7 (Curran, West, & Finch, 1996). Data were analysed for skew and kurtosis. Table 5 presents the skew and kurtosis results for depression, sense of belonging, social support, and mood for the control group.

Table 5

Levels of Skew and Kurtosis in Raw Data for the Control Group

	Week	Skew	*SE*	*Z*	Kurtosis	*SE*	*Z*
Depression	0	0.43	0.55	0.78	0.32	1.06	0.30
	6	0.39	0.55	0.71	-0.59	1.06	-0.56
	14	0.49	0.55	0.89	0.86	1.06	0.81
Social	0	0.05	0.55	0.09	-0.44	1.06	-0.42
support	6	-0.45	0.55	-0.81	-0.67	1.06	-0.63
	12	0.03	0.55	0.05	0.66	1.06	0.62
Sense of	0	0.41	0.55	0.75	-0.70	1.06	-0.66
belonging	6	1.19	0.55	2.16	1.83	1.06	1.73
	14	0.26	0.55	0.47	1.28	1.06	1.21
Mood	0	0.05	0.55	0.09	-0.49	1.06	-0.46
	6	-0.27	0.55	-0.49	0.92	1.06	0.91
	14	0.06	0.55	0.11	1.11	1.06	1.05

Table 5 shows that sense of belonging at week 6 has unacceptable levels of skew. All other scales had acceptable levels of skew and kurtosis. Table 6 presents the skew and kurtosis results for depression, sense of belonging, social support, and mood for the intervention group.

Table 6 shows that sense belonging at week 14 had unacceptable levels of skew. All other scales had acceptable levels of skew and kurtosis. To address the issue of skew in both the control and intervention groups a square-root transformation was performed on sense of belonging. All subsequent analysis were run on both the transformed and

Table 6

Levels of Skew and Kurtosis in Raw Data for the Intervention Group

	Week	Skew	*SE*	*Z*	Kurtosis	*SE*	*Z*
Depression	0	-0.08	0.49	-0.16	1.00	0.95	1.05
	6	0.27	0.49	0.55	-1.00	0.95	-1.05
	14	-0.3	0.49	-0.61	0.11	0.95	0.12
Social	0	-0.44	0.49	-0.89	0.90	0.95	0.95
support	6	0.26	0.49	0.53	-0.32	0.95	-0.34
	14	-0.25	0.49	-0.51	-1.20	0.95	-1.26
Sense of	0	-0.44	0.49	-0.89	0.24	0.95	0.25
belonging	6	0.03	0.49	0.06	0.60	0.95	0.63
	14	-1.66	0.49	-3.38	4.30	0.95	4.53
Mood	0	0.57	0.49	1.16	-0.18	0.95	-0.20
	6	-0.10	0.49	-0.20	0.43	0.95	0.45
	14	0.20	0.49	0.41	1.16	0.95	1.22

untransformed data. Results were the same in each case and consequently untransformed data were used.

Table 7 presents the descriptive statistics for the variables depression, social support, sense of belonging, and self-reported mood in the control and intervention group. It can been seen in Table 7 that levels of depression, social support, sense of belonging, and self-reported mood in the intervention and control group appear to be consistent across the three time points. On average, residents did not have high levels of depression

Table 7

Description of Dependent Variables

	Control						Intervention					
	Week 0		*Week 6*		*Week 14*		*Week 0*		*Week 6*		*Week 14*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Depression	4.35	2.45	4.47	1.74	5.12	2.03	4.15	1.30	4.00	1.51	4.91	1.95
Social support	64.06	5.60	65.82	3.54	65.71	5.27	66.05	5.72	67.23	4.46	64.55	5.35
Sense of belonging	13.06	2.77	12.82	2.67	12.53	3.16	14.14	2.92	12.45	3.31	11.18	2.22
Mood	5.82	1.70	5.71	1.61	2.30	2.11	5.91	1.57	5.73	2.12	5.14	1.39

in either the control or the intervention group. A cut off score of 7 or more was used to indicate potential depression as it has been found to be the best overall score to indicate depression in older adults (Lesher & Berryhill, 1994). For the control group initially two participants scored over 7 (11.9%), at week 6 it was two participants (11.9%), and at week 14 it was four participants (23.5%). For the intervention group initially three participants scored over 7 (13.6%), at week 6 it was four participants (18.1%), and at week 14 it was two participants (9%). The Pearson's *r* correlations between each dependent variable are presented in Table 8 for the control group and the intervention group. Correlations for the control group appear above the diagonal and correlations for the intervention group are below the diagonal. As can be seen in Table 8, there was no meaningful pattern of correlation observed amongst the dependent variables.

A Box's M value of 127.94 was associated with a *p* value of .38 which was interpreted as non-significant based on Field's (2009) guideline ($p < .05$). Thus, the covariance matrices between the groups were assumed to be equal for the purposes of the mixed model between groups multivariate analysis of variance. Homogeneity of variance was assessed using Levene's test. The variances were equal for all variables except depression at time point 1, $F(1,37) = 9.64$, $p < 0.05$. The variance ratio between groups was assessed using Hartley's F_{max}. The value obtained was less than the critical value required indicating that variance in the current sample is homogenous (Field, 2009).

Table 8

Pearson's Correlation Coefficients between Dependent Variables for the Control and Intervention Groups

	Time point	*Depression*			*Social support*			*Sense of belonging*			*Mood*		
Time point		1	2	3	1	2	3	1	2	3	1	2	3
Depression	1	-	.24	.70**	-.31	.04	-.20	-.51*	.16	.10	-.36	.25	-.09
	2	.69**	-	.32	-.22	-.07	.23	-.03	-.24	.36	-.60*	-.01	.27
	3	.38	.42	-	.01	-.09	-.49*	-.26	.44	.07	-.10	.11	.02
Social support	1	-.21	.02	-.49*	-	.34	-.17	.57*	.29	-.43	.46	.01	.27
	2	-.38	-.18	-.35	.74**	-	.34	.07	.00	.13	.12	.01	-.08
	3	-.29	-.07	-.32	.61**	.65*	-	.05	-.45	.27	-.31	-.15	.23
Sense of	1	-.09	-.17	.02	.20	.17	-.01	-	.39	-.22	.45	.27	-.12
belonging	2	-.10	-.11	.07	-.01	-.14	-.03	.58**	-	-.31	.51*	.12	-.23
	3	.02	.24	-.16	.31	.13	.47*	25	.17	-	.25	.25	.71**
Mood	1	-.15	-.12	-.28	.18	.34	.04	.00	-.12	-.15	-	.28	-.23
	2	-.29	-.18	-.41	.35	.22	.32	.27	.53*	.36	.14	-	.28
	3	-.38	.02	-.51*	.35	.25	.42	-.01	.11	.27	.22	.47*	-

*$p < .05$ ** $p < .001$

A mixed model between groups multivariate analysis of variance was conducted to test for between group differences, within group differences, and the interaction between group and time. Using Pillai's trace, there was not a significant main effect for group on the dependent variables, $F(4, 34) = 0.17$, $p > .05$, *partial* $\eta^2 = 0.02$, power = .08. This results shows that there was no difference between the intervention group playing the Wii and the control group on depression, social support, sense of belonging, and mood. There was a significant main effect of time on the measures, $F(8, 30) = 2.78$, $p = .02$, *partial* $\eta^2 = 0.43$, power = .86. There was not a significant interaction between group and time, $F(8, 30) = 0.91$, $p > .05$, *partial* $\eta^2 = 0.20$, power = .34. Follow up analysis of the main effect of time was done using a multivariate analyses of variance. There was not a significant effect of time on residents' self-reported mood, $F(1, 74) = 1.75$, $p > .05$, *partial* $\eta^2 = .05$, power = .34 or levels of social support, $F(1, 74) = 1.82$, $p > .05$, *partial* $\eta^2 = .05$, power = .37.

There was a significant effect of time on levels of depression, $F(1, 74) = 3.89$, $p < .05$, *partial* $\eta^2 = .09$, power = .70. This was a small effect size. Further analyses indicated that there is a significant increase in depression from week 0 to week 14, $F(1, 37) = 6.30$, $p < .05$, *partial* $\eta^2 = .15$. There was no significant difference between depression at week 0 and week 6, $F(1, 37) = .01$, $p > .05$.

There was a significant effect of time on levels of sense of belonging, $F(1, 74) = 4.28$, $p < .05$, *partial* $\eta^2 = .10$, power = .73. This was a small effect size. Further analyses indicated that there is a significant decrease in sense of belonging from week 0 to week 14, $F(1, 37) = 7.30$, $p < .05$, *partial* $\eta^2 = .15$. There was no significant difference between sense of belonging at week 0 and week 6, $F(1, 37) = .05$, $p > .05$.

In conclusion, there was no significant overall effect of playing Wii bowling on levels of depression, social support, sense of belonging, or mood. There was also no significant interaction between group and time. A significant main effect of time was established. Levels

of depression significantly increased from week 0 to week 14 and sense of belonging significantly decreased from week 0 to week 14 for both groups.

Qualitative Analyses

Detailed notes on the level of interaction between residents in the intervention group were taken at week 1, 3, and 6. Data from the Wii sessions was analysed by the researcher and coded into themes. Four categories of classification were identified within the data. Under these headings all of the key themes within the data were accounted for. The key themes identified were social interaction, enjoyment, hesitation and fear, and staff responses. Practical suggestions when using the Wii with older adults in residential care facilities were also noted.

Social interaction. It was found that the level of social interaction between group members increased over the 6 week period and diversified to include social interaction within the aged care facility outside of the gaming sessions. The level of social interaction in the first week was low. The number of items coded as indicating social interaction between residents was 21% of the total number of social interactions transcribed. This had increased to 25.7% by week 3. At the end of week 6 this had increased to 53.3% when including the number of social interactions as indicated by residents in the post-intervention questionnaire at week 6. These items included residents' comments such as "Let me help you" and "Looking forward to seeing you next week!".

In the first session of playing Wii bowling the level of social interaction between residents was low. Residents did not talk extensively amongst themselves. The discussions between residents were limited to events associated with the game play, for example, whose turn it was to play next. Residents sometimes directed others when it was their turn if there was any confusion with phrases such as "You are up!". The process of playing the game was not mastered by the residents initially. As game play was still very new for the residents, the level of interaction between the residents was restricted as they concentrated on learning the

game play. Some residents were finding playing the game difficult, and this also limited social interaction as a group. Residents indicated that it was “Fun, but tricky” to learn. Residents also required assistance from the researcher in the first session to play the game, which also restricted social interaction between residents.

Residents had begun to master the game play and Wii controls by the second session in week 1. At this stage, residents who were confident playing the game were helping and instructing each other on the process of playing when someone was unsure. When someone was struggling with a specific aspect of the game play, other residents were eager to demonstrate their mastery of the game in that area. Residents starting helping others with comments such as “Here, let me show you how” or “Watch me do it”. The process of helping each other enabled residents to improve their own knowledge of the game as well as facilitate social interaction. Residents had also learned the scoring system of the game. Consequently, residents had begun to be encouraging towards others and cheered when another participant received a good score or played well. Residents made comments such as “Bad luck” or “Good shot” to others participating indicating an increase in game engagement and social interaction between the residents by the end of week 1.

By week 3, the residents had mastered the skills required to play Wii bowling and social interaction between the residents had increased. Residents were starting to become quite competitive with each other in an effort to beat their own or another resident’s previous score. As residents watched the bowling ball on the screen, they were becoming very excited and cheered if they thought they were going to receive a good score. Other residents were clapping and encouraging those doing well with comments such as “How about you!”, “You have been practising!”, or “Better luck next time!”.

The residents by this stage were starting to become very engaged in the competitive aspect of the game play. They showed more engagement with the game and with other

residents when they were winning, or when they were playing well. This was especially evident for the male participants. They took great interest in the score of the game and took note of their high scores in each session. Residents talked about previous good scores, and liked to engage other residents through statements such as “Did you see that?” or “That’s your best score yet!”. This was a source of enjoyment for the residents, was a topic of conversation, and a basis of social interaction at the sessions.

The level of social interaction had also increased by week 3, possibly due to the shared learning aspect of the game play. Residents were learning a new skill in a group environment. This facilitated social interaction as residents had learned different skills or techniques for playing the game and were eager to share this knowledge with others. The process of sharing tips on how to improve their score was a major source of social interaction. Some residents had become very adept at playing the game and particularly enjoying helping others to improve by showing them how to play. For one resident, helping others was something she went out of her way to do each session by getting out of her seat to show others when they were having difficulties.

Another aspect of social interaction that became apparent by week 3 was an increase in interaction between the residents outside of the gaming sessions. One resident commented that she was seated at the same dining table as others who played in the same Wii session, “We sit on the same table so it was good to get to know them some more”. She advised that since they had started playing the Wii together, they were talking with each other more at meal times. Initially, the conversation was about the game, and their individual reasons for involvement in the research program. As the weeks progressed, she advised they had started to talk about other interests such as family and previous life experiences. She advised this was very enjoyable to her as previously meal times had been very quiet. Playing the Wii was an interest to all of them which had provided a start to the conversations they were now having

during meal times.

Week 6 was the final week of playing Wii bowling at the aged care facilities. Residents were by this stage eager to play the game. Residents were waiting to begin each session before the researcher arrived. At the beginning of the research period, the researcher had to remind each resident when it was their turn to take part in the sessions. Residents were also reminding each other at meal times of upcoming sessions to ensure they would be able to compete together.

Residents were becoming very adept at playing the game by week 6. They enjoyed showing off and bragging to others about their recent high scores and achievements. One resident was unable to attend a session the previous week, and on their return, the others in the session informed him of their high scores and good shots while he was away. Residents also became very animated and excited about both their own, and others', good scores. They were at times very loud, and cheered about good scores. This shows an increase in social interaction due to the game play, and the formation of friendly competitive relationships within the residential care facility. Residents had also taken up teasing each other about poor shots and bad scores in a friendly way. Male residents particularly enjoyed this type of competitive interaction, as they stated it was similar to previous competitive social interactions they had commonly had outside of the facility.

The intervention evaluation questionnaire was administered after the 6 week research period had ended. Residents expressed that a part of the game play they especially enjoyed was the opportunity to help others learn a new skill. The ability to help other residents when they were struggling with a section of the game was crucial to some resident's enjoyment, and the facilitation of group conversations throughout the sessions. One resident in particular stated that due to her disability, she was not often able to provide help to anyone within the care facility. Wii bowling was something she was very skilled at playing and she really

enjoyed being able to help, and interact with others in a way she was previously unable to do within the facility.

Residents stated that the game had also facilitated a new opportunity for social interaction within the residential care facility. The game was an “Opportunity to mix with nice people” and it was “Fun” and “Kept the mind active”. One resident stated that she was appreciative that she “Got to know other residents, we sit on the same table so it was good to know them some more”. This indicates that participation in the Wii bowling sessions enabled residents to get to know other people within the facility that they previously had not known.

Another resident also expressed that playing Wii bowling had helped to facilitate social interaction outside of the aged care facility. The resident advised that they were now able to play the game with a grandson, and was especially pleased when they were able to beat them in a game. He was very proud of being able to master the skill of playing Wii bowling to enable him to compete with his grandson. This was also a great source of enjoyment for him as he was able to interact with his family in a new way that helped to bridge the age gap between the resident and their grandson.

Some residents were unable to participate in all the sessions due to physical limitations or illness but were happy to watch others play. This did not appear to have an effect on the level of social interaction in the group. Residents who were playing always involved others in the game play and encouraged them to give the game a go to the best of their abilities. Residents stated that they “Liked to watch others playing as it was interesting and exciting” or that they “Really enjoyed watching other people play when it was too hard for me to play”.

At the 2 month follow up residents were playing the Wii a couple of times a week at one of the facilities. This was not a structured activity run by the lifestyle staff. The residents were organising the sessions between themselves and playing the game without the

involvement of staff. The residents involved in organising these sessions were also encouraging new and existing residents to “Give it a go” and “Try it out”. They were enthusiastic for new people join in the game and compete with them.

Enjoyment. Throughout the 6 week research period there were three distinct components of playing the Wii that contributed to residents’ enjoyment. These components were the challenge of learning a new technology, pride in their ability to master the game, and the similarity between the Wii and other sports they used to play. The level of enjoyment coded did not increase over the research period. At week 1 the number of items coded as indicating enjoyment was 35.3% of the total number of items coded as enjoyment. This was 41.2% by week 3. At the end of week 6 this had decreased to 23.5% when including the enjoyment transcript codes as indicated by comments mentioned by residents in the post-intervention questionnaire at week 6.

In the first and the third week of the research period, residents expressed a number of times that they enjoyed the challenge the game offered them. Playing the Wii was “Something different to learn” and “New”. Residents expressed that they had “Never played it before,” and it was “Enjoyable to learn”. They advised that it was “Fun”, “Tricky”, and “Challenging” all at once. A number of residents also mentioned that it was enjoyable as it “Was hard to learn, but still fun”. Residents were very intent on mastering the new skill and found great enjoyment in the challenge that the game offered them.

Another enjoyable aspect of the game play that became evident in the later part of the 6 week research program was pride. The majority of residents had mastered how to play the game, and had become adept at playing by week 3. Residents showed great pride in the high scores they obtained. They often went on to tell other residents about previous achievements in the game, “I got three strikes last week” or “I beat my top score!”. Residents also showed great pride when they had mastered a certain aspect of the game play, such as aiming the

virtual bowling ball. This gave them a sense of achievement and they enjoyed showing off the new skills to other residents. For some residents, it was initially hard to learn as the Wii is on a platform that is not familiar to older adults. Due to this difficulty, there was a degree of challenge associated with mastering the game. This aspect of the game appealed to a number of residents.

Residents expressed that a part of the game play they enjoyed was winning. One resident expressed that “When I was able to win, winning was the best part of playing”. Winning was a crucial part of the game play as residents saw this as proof of their ability to overcome the challenge of an unfamiliar technology. Some residents wanted to continue to play the game well past the end of the session just to enable them to win a game. This may have contributed to the ongoing enjoyment of the game.

The third aspect of playing that Wii that was enjoyable to residents was the similarity between the game and sports. This was particularly relevant for the men who participated as they were no long able to take part in team sports. One resident expressed that a number of aspects of playing the game was similar to participating in the team sports he used to enjoy, such as the competition and friendly banter. He expressed that he was no long able to participate in team sports due to physical limitations. He advised that playing the game was “Just like” some of the sports he used to participate in and he enjoyed participating in a similar activity again.

Hesitation and fear. In the first week of playing the Wii, a number of residents were hesitant to play the game, mainly because they were not confident using new forms of technology. The wireless remote used with the Wii console was very unfamiliar to some residents. Some residents were embarrassed if they made a mistake and were concerned about appearing “Childish” in front of other residents. Hesitation and fear associated with game play decreased across the 6 week intervention. In week 1, the number of items coded as hesitation

or fear was 61.6% of total items. By week 3 this had decreased to 15.4%, and 23.1% at week 6.

Residents were hesitant to play as they were embarrassed about being unable to play or about making a mistake. A number of residents did not want to initially try and play the game, or were unwilling to be the first person to play the game at each session. With some encouragement from the other residents they became willing to try the game, especially after someone else had taken the first turn. The level of hesitation decreased across the research period. By the third week of the research, residents were more willing to try the game and more accepting of their own mistakes. This was because they started to see other residents make the same mistakes as them, which in turn reduced feelings of embarrassment. By the last week of the research, residents were less fearful of making a mistake in front of the other residents, as mistakes became commonplace for all of those involved.

A number of residents expressed that they were concerned about playing the game as it was “Silly” and a “Game for children”. They felt the Wii was designed for a child and inappropriate for their age group. This reduced by week 3 as other residents were encouraging those who did not play to also get involved in the game. Residents who had mastered the game play took it upon themselves to encourage and show others how to play and attempted to get them involved. This encouragement enabled hesitant participants to become involved in the game play. This also reduced any feelings of playing a game designed for children as they saw others participating and enjoying the game play.

Staff response. At the first session staff members were not enthusiastic about the use of the Wii. Members of staff were not confident that residents would be able to learn to play or that residents would enjoy the game. Towards the end of the research period, staff opinions had changed substantially. At the end of the research period, staff advised that “It was a new experience for residents”. They were also enthusiastic about the game as it enabled residents

who were in a wheelchair to actively participate in the activity. Members of staff also identified that one of the benefits of the system was that residents with physical and cognitive disabilities were also able to be involved. These residents were interested to watch and were still able to become involved in the game play.

One member of the nursing staff commented that she thought something must have been wrong as she had not heard so much clapping and cheering coming from an activity in a long time. Residents were very animated, and she commented that it was “Great to see them having a good time”. She advised that the residents had commented to her that they were enjoying the game.

At the first aged care facility, residents continued to play the Wii without staff intervention after the research had concluded. However, at the second care facility staff were only able to get residents to play the game as part of a structured exercise program**.** The staff at the first site were pleased to see the residents showing some involvement in their activities and that they were coordinating their own activities as this had not happened previously. Residents at that facility coordinated their own session times with each other after the end of week 6. One member of staff at the first care facility stated that she did not think it was going to encourage residents to coordinate their own activities. She advised at the end of the research that she had to “Eat her hat” as she had been trying for a while to get residents to coordinate their own daily activities within the facility. Wii bowling was the first activity in this facility that residents were running themselves.

Staff members stated that they would like to continue to use the Wii in the future, but they were concerned that residents would require encouragement to participate. This was because some residents struggled to play the game. Staff members also advised that although residents enjoyed the game for 6 weeks, in the long term residents were more likely to enjoy traditional bowling. One member of staff advised that this was because traditional bowling

was more familiar and accessible to older age groups.

Practical suggestions. During the research, a number of modifications were made to the game play to make it easier for residents of all physical capabilities to participate. These changes were implemented at both residential facilities by the researcher and members of the nursing staff. Residents at both facilities were encouraged to play the game while seated to prevent falls and/or to reduce the amount of movement required during game play. Residents were provided with chairs with low, or no arm rests to enable them to still swing the remote to play the game while seated. For each session, four chairs were placed in a semi-circle in front of the Wii game. Residents did not have to get up or move around when it was their turn but played from a seated position. Members of staff were very encouraging of this set up as they felt it greatly reduced the risk of falls, and also facilitated quicker game play.

In one of the residential care facilities, the top scores for each resident were written up on a white board. This was left in the common room following the final session for the day. Residents showed enjoyment at being able to compare their scores with other residents across different sessions. This facilitated social interaction between residents and staff at the end of the day as they discussed each other's scores and how specific residents were improving each session.

Results summary. In summary, when examining the use of the Wii console in residential care facilities to reduce levels of depression, increase mood, increase social support, and increase sense of belonging, no significant difference between the groups were found. There was also no significant interaction between group and time. A significant main effect of time was established. Levels of depression significantly increased from week 0 to week 13, and sense of belonging significantly decreased from week 0 to week 14.

When examining the qualitative data, there was an increase in social interaction within the facility and residents expressed enjoyment when playing the game due to the competitive

and interactive nature of the game play. Members of the nursing staff were surprised that residents were able to master the game play, and that residents continued to use the Wii after the research period had concluded. The results provide limited support for the improvement of the overall psychological health of aged care residents who were encouraged to participate in a group intervention involving the Wii.

Discussion

The aim of the study was to investigate whether playing Wii bowling in groups would improve the overall psychological health of residents in aged care facilities. Residents were assessed on their levels of self-reported depression, sense of belonging, social support, and mood. Social interaction while playing the Wii was assessed in the intervention group. Residents participating in the invention group were compared to a control group who did not participate during the first 6 weeks of the research.

It was hypothesised that playing Wii bowling in small groups would lower levels of depression and increase social support, sense of belonging, and mood. It was hypothesised that the group playing Wii bowling would show an improvement on all variables when compared to a control group who did not participate. This hypothesis was not supported. There was no change in residents' levels of social support or mood, levels of depression increased, and sense of belonging decreased in both groups by week 12. The introduction of the Wii after week 6 in the control facilities did not improve levels of social support, mood, depression or sense of belonging when compared to week 6. The level of social interaction between participants who were playing Wii was hypothesised to show an increase over time. This was supported by the data obtained.

The results obtained in the present study provide limited support for the use of the Wii as an intervention to improve the psychological well-being of residents in aged care facilities. The findings across the qualitative and quantitative analyses varied. The use of the Wii did not

result in any significant improvement in the residents' reported levels of depression, sense of belonging, mood, or social support when compared to a control group. There was also no significant interaction between group and time. A significant main effect of time was established across both groups. Levels of depression significantly increased from week 0 to week 14, and levels of sense of belonging significantly decreased from week 0 to week 14 in both groups. There were no significant differences between week 0 and week 6. This indicates that on the self-report measures, there was no evidence for the effectiveness of the Wii to improve residents' psychological health.

The results obtained from the qualitative interaction analyses indicate that residents enjoyed and interacted while playing the game. Social interaction between residents increased over the 6 week intervention period and levels of enjoyment were consistent across the intervention period. Participation in the intervention assisted residents to engage in new social interactions within the facility, engage in friendly competition, and provided some residents with a sense of achievement when they mastered the game play. This engagement with other residents within the facility shows that playing Wii bowling has the potential to increase the level of social interaction within the facility. Although this did not result in any significant improvements in the global self-report measures, participation in the intervention was able to facilitate improvements in a number of different aspects of the day to day lives of the residents and provide them with a novel and fun activity.

Depression

Results from the present study did not support the hypothesis that playing Wii bowling would result in a significant decrease in residents' reported levels of depression as measured by the Geriatric Depression Scale Short Form (Yesavage & Sheikh, 1986). The residents' reported levels of depression showed an increase over time from week 0 to week 14 in both the intervention and the control group. Previous research has been inconsistent when

examining the relationship between depression and interventions involving Wii bowling.

Rosenberg et al. (2010) found that playing the Wii was associated with a reduction in the level of subclinical depression. This study utilised a limited number (n = 19) of community dwelling older adults. Residents in care facilities have been found to be at higher risk of depression when compared to older adults living in a community setting, which may explain the inconsistent results with the present study (Jongenelis et al., 2003). Community-dwelling older adults are also less likely to present with physical or psychological disabilities which also limits comparison to the present study.

Participating in an intervention involving the Wii has previously been shown to reduce levels of depression in aged care residents (Homma, 2009). This reduction however, was not a significant reduction in depression levels. This research did not utilise a control group preventing comparison between groups.. This is consistent with the current research findings as levels of depression did not decrease over the intervention period, however residents' levels of depression increased by the end of week 14. Similarly, however to Homma, residents reported enjoying the game play and learning new skills. Improvements in overall levels of depression may not have been achieved by Homma and in the present study due to a number of factors, such as the length of time residents were involved in the intervention, and the overall pervasive environmental factors effecting aged care residents.

The findings in the current study may be explained by an overall lack of mastery, as evidenced by an increase in depression for both groups from week 1 to week 14. In residential care facilities, up to 49% of the variance in depression scores can be attributed to residents' reported level of mastery (Knight et al., 2011). While living in aged care facilities, residents are unable to exercise control over their daily routines or environment. In the present study, a resident advised that they were unable to control the temperature of their room, which had resulted in ongoing sleep problems. Another resident advised that they were unable to keep a

potted plant she was gifted due to the mess this was causing in the room. Both of these occurrences were quite upsetting for the residents involved, and indicated that they were experiencing a lack of environmental mastery over their day to day lives. Residents in care are also more likely to be physically disabled or suffering from a chronic illness, which can in turn reduce the level of control and mastery residents have over their care and living environment (Cuijpers & Van Lammeren, 1999; Jang et al., 2006).

A lack of control over their environment and personal care can reduce residents' feelings of mastery. This can, in turn, contribute to an increased risk of depression, psychological distress, and ongoing health concerns (Davison et al., 2012; Forbes, 2001). To achieve a feeling of environmental mastery, and in turn reduce the risk of associated psychological health concerns, residents may require a significantly greater amount of control and power over their daily routines and care. This may explain the lack of improvement in levels of depression during the intervention period, and an increase by week 14.

Mood

Results of the present study indicate that there was no significant change in residents' self-reported mood from week 1 to week 14 as measured by a visual analogue mood scale. Only one previous study has investigated the effects of playing the Wii on mood in older adults. Kahlbaugh, Sperandio, Carlson, and Hauselt (2011) found no change in self-reported mood over a 10 week intervention playing Wii bowling. This is consistent with the present study there was no significant change in mood at week 0, week 6, and at week 14. The lack of improvement in mood may be due to the underlying concept of mood as a subjective, internal state (Amado-Boccara et al., 1993). To facilitate an ongoing change in mood, residents may require a more engaging care environment, as well as a greater amount of control and power over their daily routines and care as discussed above.

Social Support and Interaction

Results indicate that there was no statistically significant difference between the intervention and the control group in their levels of perceived social support, as measured by the Social Provisions Scale (Curtrona & Russell, 1987). Residents reported levels of social support were consistent across the research period for the control and intervention group. The qualitative data collected throughout the research indicated that the residents had an increase in social interaction while participating in the intervention, and this may have extended to include an increase in social interaction within the residential care facility. Residents expressed that they had increased their level of social interaction within and outside the home potentially due to involvement in the research.

The results from the qualitative analysis provide support for the intervention program as it was anticipated to increase social interaction and facilitate the formation of new social networks and relationships within the aged care facility. Results suggest that residents may have experienced an increase in meaningful social interaction and group engagement over the 6 week research period. Residents who were taking part in the intervention program were also able to establish or improve their social network within the residential care facility through shared involvement in the research. Residents expressed that the game was fun, and that they enjoyed the challenge of learning a new skill.

To establish the overall effect of participating in Wii bowling session, Higgins, Horton, Hodgkinson, and Muggleton (2010) conducted in depth interviews with nursing staff at aged care residential facilities. The staff indicated that the use of the Wii had encouraged more social interactions between residents. The results obtained in the present study are consistent with Horton et al.’s findings as nursing staff also expressed surprise that residents were able take control of their own activity sessions and form new social groups due to playing the Wii together. Even though the use of the Wii had facilitated the formation of a greater number of social interactions within the facility, these interactions did not result in a

significant change in overall self-reported levels of social support in the participants.

Previous research has not found a significant overall change in psychological well-being due to playing the Wii. Research has shown, however, that participants experienced enjoyment and improvement in reported levels social support due to involvement in group Wii sessions (Gerling & Masuch, 2011; Keogh, et al., 2014;). Previous research has also indicated that the game play was discussed with other residents after the sessions had ended, extending social interaction beyond the intervention sessions and that participants playfully mocked residents who lost (Gerling & Masuch, 2011).

The results obtained in the present study are consistent with the findings of Gerling and Masuch (2011) and Keogh et al. (2014), as residents also engaged in friendly mocking of each other and discussed the game play outside of the sessions. Participants may have engaged in social activities, and increased their social network within the home, but this was not able to significantly improve overall levels of social support. Keogh et al. also found that playing the Wii provided residents with a new avenue for socialisation within the facility. One explanation may be that to enable social support to be increased, a longer time period for the intervention may be required.

A longer intervention period may be required due to the underlying concept of social support that was measured in the present study. Social support was measured using the Social Provisions Scale (Curtrona & Russell, 1987). The questions include “There are people I can depend on for help if I really need it” and “I feel a strong emotional bond with at least one other person”. The concepts being measured by the Social Provisions Scale may take a longer time period to be established than was available in the present study. Residents may have formed new, friendly social interactions within the facility, however this may not have translated to the formation of ongoing, meaningful, and dependable social support within the aged care facility.

Sense of Belonging

There was no significant difference in levels of sense of belonging between the intervention and the control groups. Unexpectedly, there was a significant decrease in sense of belonging from week 0 to week 14 across both groups. Sense of belonging was measured using the two key concepts of sense of belonging, value and fit (Hagerty et al., 1992). These two aspects of sense of belonging are essential for well-being and the development of a greater overall, ongoing relatedness to others. It was proposed in the present study that sense of belonging could be improved through participation in a meaningful group intervention within the care facility. This was based within the aged care facility due to limited access to the broader community. Merely participating in a group intervention however, may not have promoted a feeling of belonging to the group or to the overall community within the home (Bailey & McLaren, 2005). Significant improvements to the levels of sense of belonging require the presence of energy, desire for involvement, and the potential for shared characteristics (Hagerty et al., 1992).

Residents in the present study reported an improvement in their level of social integration in the facility due to participation in an enjoyable group activity. An overall improvement in sense of belonging however, requires involvement (psychological, social, spiritual, or physical), attribution of meaning to the involvement, and establishment of social responses and relationships to other people (Hagerty et al., 1992). Residents participating in a group intervention may have experienced some improvements in the social aspect of sense of belonging such a fitting in with other people, but no improvement in other aspects such as a feeling of belonging to the environment. Residents in the present study may have also been lacking in a number of precursors for the development of an ongoing sense of belonging such an energy and desire for involvement due to poor physical or psychological health. This may have resulted in a decrease in sense of belonging over time.

In the present study, residents were offered the opportunity to participate in an activity to help improve their levels of sense of belonging. Residents in both groups showed no change in their levels of sense of belonging between week 0 and week 6, and a decrease in their levels of sense of belonging by week 14. Residents advised in the post-intervention qualitative interview that they experienced more social interactions within the facility, however this may not have translated to an improvement in overall levels of sense of belonging due to pervasive environmental factors in aged care. It is essential for the development of overall psychological health and quality of life that residents have the opportunity to develop interactions and relatedness with other people and their care environment. A significant improvement in levels of sense of belonging may require residents to feel a sense of involvement in a number of aspects of their environment and care, as well as a sense of involvement and connection with other people. The current intervention program may not have been able to improve levels of sense of belonging as it was not an intervention that involved all aspects of their lives and care. Also, the length of time the intervention was conducted may not have been sufficient to enable residents to form relationships that allowed them to feel valued and important. The current intervention program has the potential to be implemented as part of a broader program to increase the number and quality of social interactions residents have with people, both within and outside of the home.

Ongoing use of the Wii as an activity may help to improve overall levels of sense of belonging by encouraging residents to use new technology and establish connections outside the facility. Older adults may not perceive themselves as someone who uses technology in their day to day life, which can prevent new skills being learnt in old age (Nap et al., 2009). Reducing hesitation and fear associated with the use of new items may encourage residents to use other forms of technology, such as the internet in the future. The Wii is an easily accessible platform for older adults to learn to use. The Wii involves playing games of which

many would be familiar to older adults, such as bowling and golf. This may help to break down some of the barriers older adults face when attempting to use new technologies, leading to older adults attempting to learn to use other forms of technology (Kiel, 2005). The use of different forms of technology may encourage older adults to stay socially connected and informed of current events. Staying connected through a variety of mediums may encourage older adults to foster a sense of connection with family, friends, and the community outside of the home. This in turn may also lead to an improvement in sense of belonging over a longer time frame than the current research was conducted.

Qualitative Findings

The results of the interaction analysis indicate that the residents enjoyed participating in the intervention. Participants indicated that participation in the gameplay was a fun, entertaining, and novel experience for them. Although this has not resulted in any improvements in overall standardised measures of psychological health, this is still an important function of the Wii as an intervention in residential care facilities. These results are consistent with Keogh et al. (2014) who also found that residents reported that playing the Wii made them feel good, enabled them to have fun, and was something to look forward to. Residents are at an increased risk of feeling isolated and lonely, even when in the company of other people (Knight & Mellor, 2007). Residents may have little, or no contact with people or the community outside of the home. This may result in residents becoming very isolated (Choi et al., 2008). Participation in an intervention that is enjoyable, and also includes a social aspect may help to alleviate the experience of loneliness and isolation.

Residents involved in the intervention group playing Wii advised that it was a fun and enjoyable activity to take part in. The intervention also involved a social element as the game is played with, and in competition with, other residents. The combination of both an enjoyable activity and social interaction may encourage ongoing participation and engagement in the

activity. This may result in residents experiencing an ongoing improvement in their level of social interaction, and a decrease in loneliness within the home for those with limited social contacts in the community. Residents may also experience a diversification of their social networks within their home though participation in an ongoing, enjoyable, social activity that was also challenging.

The Wii provided a challenge, there was interaction between the players, a level of skill was required, and there was a definite winner at the end. These aspects are something that traditional residential care activities may not be able to provide to residents. Traditional residential activities may not enable residents to actively engage and compete with each other. This type of competition is something that male residents especially enjoyed, and can miss once they have moved to care. All these factors contributed to the enjoyment of the game for residents who had previously enjoyed competitive sports. For men, this was a particular feature of the game play they enjoyed.

Older men are at an increased risk of isolation in residential care facilities. Older women outnumber older men in old age and this results in older men becoming a minority within aged care homes (AIHW, 2012c). The activities run in care facilities may not cater to men's interests or needs. When compared to female residents, male residents have lower perceived social support, their social ties are weaker, they are less likely to be satisfied with their lives, less likely be involved in reciprocal relationships, and less likely to participate in activities (Park et al., 2009). Consequently, it is especially important to assist older men in the development of meaningful social interactions within the residential care environment. In the present study, men expressed that they enjoyed the competition and friendly teasing they engaged in with other residents. They also enjoyed playing a game that was similar to the team sports they used to compete in. For men, ongoing use of the Wii may be particularly beneficial in overcoming some of the problems associated with residential care due to the

competitive nature of the game play.

Overall Discussion

The results indicate that involvement in the intervention is able to facilitate an improvement in residents' levels of social interaction and an enjoyment of a new activity at their place of residence. There was no significant difference between the control group and the intervention group on levels of depression, social support, mood, or sense of belonging as measured by the self-report scales. The qualitative interval analyses data collected indicated that residents experienced a greater level of social interaction. There are several possible overarching explanations for these results and these are presented below.

Residents who are asked to participate in an intervention program twice a week, for 6 weeks may not experience an overall improvement in psychological health due to more pervasive, ongoing factors associated with living in a residential care facility. Residents in care facilities are at a higher risk of depression (Jongenelis et al., 2003), lower levels of social support (Winningham & Pike, 2007), and lower levels of sense of belonging (McLaren et al., 2013). The environment within the residential care facility does not often help to alleviate symptoms of depression or low mood (Harper, 2002). Residents also experience a number of risk factors associated with poor psychological health, such as loss of freedom, autonomy, privacy, social isolation, reoccurring death and grief in the home, lack of purpose and mastery, high staff turnover, and boredom (Choi, Ransom, & Wyllie, 2008; Davison, McCabe, Knight, & Mellor, 2012; Dow, Lin, Tinney, Haralambous, & Ames, 2011). In summary, residents in aged care facilities are at an increased risk of a number of negative psychological outcomes due to both environmental and physical health concerns.

Residents participating in an intervention twice a week, for 6 weeks may not be able to significantly improve their overall psychological health due to the overwhelming number of risk factors associated with living in aged care. Although residents in the present study

indicated that they enjoyed the intervention program, and it may have helped to facilitate social relationships to form within the facility, this may not be enough to overcome long term, pervasive problems associated with living in an aged care facility. The interactions residents experience within the care facility on a day-to-day basis may have contributed to these findings.

The Theory of Human Relatedness provides a possible theoretical explanation for the results found in the present study. The interactions and relatedness that a resident has with their environment, and the people in it, can have a significant effect on the overall psychological health and the quality of life experienced by a resident. The Theory of Human Relatedness (Hagerty et al., 1993) states that the establishment and maintenance of relatedness to others, objects, environments, society, and the self is a pervasive, essential human concern. The theory states that to experience meaningful social relationships there must be a level of relatedness with objects, environments, other people, as well as groups. Sense of belonging is one aspect of the overarching Theory of Human Relatedness. Residents in care often have limited opportunities to develop meaningful interactions with people inside the home. This may be due to a number of pervasive concerns as enforced seating plans, highly structured activities, and the wide range of physical and psychological impairments present within the one facility (Park et al., 2012). All of these factors may inhibit the formation of meaningful social interactions with the home, and in turn account for the decrease in sense of belonging and increase in depression seen over time in the present study.

Another possible explanation for the current findings is that social interactions from a number of different sources are required to improve overall levels of depression, social support, and sense of belonging. Residents in the present study were provided with an opportunity to increase the frequency of meaningful social interactions within the facility. This type of social interaction is provided within the structure of the Wii intervention. This

may have limited the benefits gained from the interaction as it was a planned activity and was not a spontaneous, unplanned social interaction. Some residents may have felt that the social interaction within the intervention was organised, resulting in it becoming forced social interaction. It is important for older adults to receive social support from a number of sources and in a number of aspects of their life. Weiss (1974) outlined that social support needs to be provided from a number of sources such as partners, family, neighbours, and co-workers (Tomaka et al., 2006). As the current intervention only targeted once aspect of a resident's social network, and was a planned social activity, this may partially explain the lack of change in reported levels of social support.

It is important for older adults to maintain voluntary contact with family and friends outside the aged care facility. Voluntary social interaction with friends in comparison to family members, has the greatest impact on improvements in cognitive functioning (Glei et al., 2005). In the present study residents may have felt the social contact they experienced within the intervention program was not providing them with ongoing social support. Residents may have perceived the social contact as focusing on the game play for the duration of the intervention only. This too, would have limited the effect participation would have had on overall levels of social support and belonging. To increase social support over time, residents require social interaction and support from a number of sources, such as family and friends (Tiikkainen et al., 2008).

Residents in care can also withdraw from forming new social relationships within the home due to the high mortality rates in aged care facilities. Over one third of residents die within the first year of being admitted to care (AIHW, 2012c). Residents may, over time, withdraw from forming new social relationships with others within the home to avoid the reoccurring occurrence of grief. In the present study, one resident stated that a friend of hers within the facility had recently died. She advised that she was no longer willing to form close

friendships within the facility as she did not want to experience any more loss in her life. This experience may have occurred to a number of residents, which in turn may have prevented them from actively engaging in activities and forming meaningful social relationships within the home.

The negative effect of high mortality rates on social interaction has also been supported by O'Connor and Tan (2012) who interviewed residents on their experience of death within aged facilities. Residents did not always experience grief at a death, but often a feeling of gladness that the resident no longer suffered. Residents reported that they often felt that they did not know others beyond that of an acquaintance. A death within the home was only a cause of grief and sadness to the resident if it was that of a close friend. O'Connor and Tan suggest that a lack of connection between residents may occur over time. Residents may be disengaging from others to protect themselves from further emotional losses. Residents may, in turn, experience loneliness and lack of social support regardless of whether this was consciously chosen or not. This has been shown to have a negative effect on resident mortality rates and cognitive functioning over time (Dénes, 1980; Luanaigh & Lawlor, 2008).

In conclusion, there was no significant difference between residents who played the Wii and those in the control group, as measured by self-reported levels of social support, depression, sense of belonging, and mood. Depression had increased and sense of belonging had decreased by week 14 in both groups. Field notes taken during the intervention indicated that residents enjoyed the game play and were able to form new social connections within the home. The involvement in the intervention, however, was not sufficient to improve the overall reported levels of the psychological indices. The findings of the present study may be explained by a number of more pervasive risk and lifestyle factors associated with living in a residential care facility. Residents may experience a lack of mastery over their environment along with limited opportunities for social interaction both within and outside the aged care

facility. Residents may also be choosing to withdraw from developing relationships within the facility due to ongoing loss and grief within aged care. A combination of all these factors may have contributed to the present findings.

Implications and Findings

The findings add to the current body of knowledge about feasible interventions and current practices in the development of residential care activities. Playing Wii bowling in small groups may be able to help facilitate social interaction within care facilities. This is in a format that can be enjoyable, easy to use, and also provides some residents with similar experiences to that of competitive sports. These findings indicate that lifestyle coordinators and residents may benefit from introducing a program involving Wii bowling. An intervention using Wii bowling aimed at increasing social interaction over a longer time period may help to improve levels of social support and sense of belonging within the home, and help reduce levels of depression through shared social interaction. This is regardless level of physical disability as the game is accessible to a wide range of residents.

The findings of the present study also add to the current body of knowledge by supporting emerging theories in the residential aged care literature. The present study provides further support for the importance of an integrated care environment that assists residents to develop a sense of belonging, establish social support networks, and lower levels of depression through a range of activities and interventions both within and outside of the care environment. The present study supports further application of the principles of the Theory of Human Relatedness to the aged care model through the establishment of a care environment that encourages the maintenance of relatedness to others, objects, society, and the self.

The process of relocating into an aged care residential facility may cause significant stress for the residents. Relocations that result in poor adjustment are associated with feelings

of powerlessness in response to crisis (Lee, Simpson, & Froggatt, 2013). Once the resident has relocated, family and friends cannot be around all the time, so interactions within the home are essential to well-being (Park, 2009). Residents who develop meaningful social interactions within the home may have better overall psychological well-being than those who do not establish those connections inside the home (Park, 2009). The establishment of an integrated care environment that facilitates the formation of meaningful social interactions, a sense of belonging to the aged care community, and an improvement in environmental mastery is essential to residents' psychological health. This should coincide with an ongoing continuity of health care. Wii bowling is an activity that can be an easily integrated into the aged care environment. It allows residents to interact socially in a fun and competitive way. This may encourage the development of meaningful social interactions within the home, however the establishment of an overall integrated care environment that increases the levels of sense of belonging and mastery may be required to improve the overall psychological health of aged care residents (McLaren et al., 2007).

Limitations

A number of limitations have been identified in the present study. The first limitation is the rate of depression in the current sample. The rate of depression in Australian aged care facilities has been reported as 40.5% of residents in high level care and 25.4% of residents in low level care (Snowdon & Fleming, 2008). For the control group the number of residents who were above the cut off score for depression ranged from 11.9% to 23.5% and for the intervention group depression ranged from 9% to 18.1%. The change in levels of depression in a short period of time may be due to some residents intentionally or unintentionally downplaying any symptoms of depression they may be experiencing. These levels are, however, lower than levels of depression previously reported in the literature. As participants in the present study may have been less depressed than the average aged care resident, this

reduces the generalisability of the present study to the aged care population.

The measures of depression, social support, and sense of belonging rely heavily on residents self-reporting. There have been concerns raised about the appropriateness of using self-report measures with older adults as they may perceive the questions as meaningless or invasive, resulting in them being unwilling to take part in the assessment (Tuokko & Hadjistavropoulos, 2014). This in turn may result in residents downplaying any symptoms of depression they may be currently experiencing. Residents may not accurately represent their level of social support or depression to the researcher as they may be unwilling to share intimate, and potentially negative, information about their social contacts. In the current study, assessments were done one-on-one with the researcher. Residents may have been unwilling to express feelings of depression or a lack of social support as they may have not felt comfortable in the situation as it was novel and unusual. The researcher was not known to the residents previously, which may have also influenced the accuracy of the responses on the self-report measures as residents may have been unwilling to express themselves fully in the presence of a stranger.

Another possible explanation for the lower levels of depression is recruitment challenges when studying depression in older adults. Older adults who are experiencing depression are more likely to refuse research invitations (Thompson et al., 1994). This may be for a number of reasons such as fear and suspicion of research studies (Uman & Urman, 1990) or physical health concerns preventing participation in the current study. The symptoms of depression which include loss of interest or pleasure and difficulty concentrating may also present a recruitment challenge (American Psychiatric Association, 2000). Residents who are experiencing these symptoms may be less likely to volunteer to participate in an intervention study requiring ongoing participation. In the current study residents were screened for dementia and severe physical disabilities. Due to this, the sample of residents who

participated may have had lower levels of depression, and in turn higher levels of social support and sense of belonging, than the general aged care population.

Another limitation of the present study was the convenience sampling of aged care facilities. In order to recruit residents from a facility, the researcher contacted the facility manager to gain written consent to conduct the research. This was via a phone call, and then a follow up email to outline the research. There was a 22% response rate from the facilities contacted. A number of facilities advised they did not have time to be involved in research, or did not have the facilities to accommodate the research project. Due to this, facilities that agreed to participate may have been more progressive and open to change, resulting in greater overall resident satisfaction and sense of belonging. Facilities who agreed to participate also ran a number of progressive activities and research programs already. This may have also resulted in residents in the current study having better overall psychological health than the general population of aged care residents.

The type of resident who was willing to participate in a research program, and were interested in a new activity, limited the generalisability of the results. The process of ageing and relocation to an aged care facility may result in individuals experiencing ongoing loss. Residents can also lose the ability to control and manipulate their environment once admitted to an aged care facility. This may result in residents experiencing ongoing feelings of helplessness (Schulz, 1976). A loss of control over time may result in residents becoming unwilling to participate in new activities and a withdrawing from their environment. Due to this, the residents in the current study who agreed to take part may have had better social integration into the residential community and be experiencing lower levels of depression in comparison to residents who were unwilling to participate due to learned helplessness. Residents who participated may also be more actively engaged in their care in comparison to residents who declined participation.

Residents in the control group had been in care for an average 2.7 years, whereas the residents in the intervention group had been in care for an average of 2.4 years. Both the control and intervention group had been in care for less time than the Australian average. The length of time spent in care varies greatly, however the average length of stay in 2010-2011 was 3.1 years (AIHW, 2012c). The residents in the current study may have spent less time in care as the participants were screened for severe dementia and severe physical disabilities. These issues are more likely to develop near the end of a resident's time in care. As residents in the present study have spent less time in care, they may have been at a lower risk of developing depression due to the risk factors associated with the aged care environment.

The length of time the intervention was run in each aged care facility was also a limitation for the present study. The intervention was conducted twice a week for one hour, for a period of 6 weeks. Residents were able to participate in a maximum of 12 sessions over a 6 week period. As this was only conducted for a period of 6 weeks, this may have limited the opportunity for social interaction between residents due to the complexities of the game. It took some residents a couple of weeks to master the game play, which would have impeded social interaction during those sessions. As the intervention was only 6 weeks, residents may also not have been able to form meaningful, ongoing social connections in that time frame.

The accuracy of self-report measures when used with older adults may have presented another limitation for the present study. Some factors, such as acute illness, changes in physical functioning, or cognitive impairment can influence the accuracy of self-reported measures in hospitalised older adults (Sager et al., 1992). Participants in the present study were not hospitalised, however residing in an aged care residential facility may influence the validity of self-report measures. A number of residents in the present study also had low level cognitive impairment as assessed by the SLUMS exam. These residents may have had trouble comprehending some of the questions, resulting in inaccurate results on the self-report

measures of depression, social support, and sense of belonging.

The present study was a pilot to ascertain the effectiveness of older adults playing Wii bowling to improve their overall well-being. The present study had low power due to the small sample size used. A GPower analysis indicated that a sample size of 79 participants per condition was required, whereas the present study consisted of 22 residents in the intervention group and 17 in the control group. The overall low power obtained and small sample size of the present study limits its generalisability to the population of aged care residents. The lack of statistical power may explain the overall lack of significant results. Greater numbers of participants in both groups are required to increase statistical power. The internal consistency of social support in the control group was also considered to be unacceptable as assessed by Cronbach's alpha. This also presents a significant limitation to the present study's generalisability.

Future Research

In future, it is suggested that the sessions be run once a week, for a longer time period than 6 week to reduce the time burden on residents and to help establish ongoing meaningful social connections between residents. In order to prevent a decline, or even potentially improve overall levels of social support and sense of belonging, an intervention period longer than 6 weeks may be required with greater numbers than the present study. A longer intervention period of three to 6 months with greater numbers would enable all residents to become comfortable with the game play and the other residents in the group to allow the engagement in ongoing social interaction. A longer time period for the intervention would also allow residents to master the game play, and improve their confidence beyond what they could learn within 6 weeks.

Playing Wii with others may be particularly beneficial for men to improve their levels of social support and sense of belonging within the aged care facility. The majority of the

residents in care are women (AIHW, 2012c). The ratio of men (20.5%) to women (79.5%) in the present study was consistent with aged care facilities in Australia. Due to older men being a minority in aged care facilities, the development of meaningful social interactions with others is especially important. Men are less likely to participate in activities and their social ties are weaker when compared to female residents (Park et al., 2009). For these reasons, engagement in gender based social groups is beneficial (Gleibs et al., 2011). It is suggested that future research investigate the benefits of playing Wii with male only groups. The engagement in an intervention that combines competition, sports, and social interaction may be particularly beneficial for men.

Another potential area of future research is the comparison of Wii bowling with indoor bowling. Indoor bowling is an activity where residents are seated in a semi-circle, each resident has a turn to bowl down the ten pins. The focus of this activity is generally exercise or social interaction. A comparison between indoor bowls and Wii bowling would indicate if there is any added benefit for residents who play using the Wii. The Wii has a number of differences from indoor bowling such as a focus on competition, a new digital platform that encourages the formation of new skills, and the ability for residents to play alone or with others in a self-directed activity without staff involvement.

Playing the Wii may also be expanded beyond the scope of the present study to incorporate a number of homes. Residents enjoyed the competitive nature of the game play, and this could be extended across aged care facilities. For a number of residents the competitive nature of the game was the most enjoyable part of the intervention. Residents may benefit from the introduction of a Wii bowling competition across multiple homes. This would afford residents the opportunity to broaden their social connections in the surrounding community, as well as provide them with a sense of camaraderie within their own facility through the development of a bowling team. In America, a National Senior League

Tournament has been established (http://www.nslgames.com). This has been a huge success. The league involves over 100 residential care facilities who are competing for a national championship each year. Residential care facilities within Australia would be able to implement a similar competition across homes in their local area. This could potentially improve residents' overall psychological health through the development of social connections within and outside their place of residence.

Conclusion

The present study has contributed to increasing our knowledge about the usefulness of the Wii as an intervention in aged care facilities to improve levels of depression, social support, sense of belonging, and facilitate meaningful social interaction. Participation in a 6 week program playing Wii bowling, twice a week with other residents did not result in a significant difference in the reported levels of depression, mood, sense of belonging or social support between the control and intervention group. Levels of depression have increased and levels of sense of belonging have decreased over time. There was an increase in social interaction between residents, and residents enjoyed the challenge of the game play. The results provided limited support for the use of an intervention involving the Wii to improve the overall psychological health of residential care residents.

Playing the Wii in groups resulted in an increase in social interaction, thus the use of the Wii as an intervention to improve overall psychological well-being as part of an integrated care environment may be warranted. Residents should be provided with a number of different opportunities to improve their levels of sense of belonging, establish social support networks, and lower levels of depression. This could be achieved through a range of activities and interventions both within and outside of the care environment.

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Appendix A

Intervention Group Plain Language Statement

SCHOOL OF HEALTH SCIENCES

PROJECT TITLE:	The Effects of Playing Wii Alone and With Others on Depression, Sense of Belonging, Social Support and Mood in Australian Nursing Home Residents
PRINCIPAL RESEARCHER:	A/Prof Suzanne McLaren
OTHER/STUDENT RESEARCHERS:	Miss Jessica Chesler, Dr Shaun Watson & Prof. Britt Klein.

Dear Potential Participant,

Thank you for your interest in this research being conducted by Miss Jessica Chesler under the supervision of Associate Professor Suzanne McLaren, Dr Shaun Watson and Professor Britt Klein, from the University of Ballarat. This study will investigate whether playing the Nintendo Wii in a small group impacts on older adults' mood and sense of wellbeing. The information collected will be of value to health professionals who work with older adults. The Wii is a video game console that detects movement from a hand held device.

If you volunteer to participate in this research you will be asked to complete a short test regarding your cognitive ability and some questions about your health to see if it is safe for you to participate in the research. If deemed eligible you will be asked to complete a questionnaire package, which asks for some background information, and questions regarding your mood (e.g., "I felt sad), your relationships with others (e.g., There are people I can depend on to help me if I really need it), your sense of belonging and your current mood. The questionnaire takes about 15 minutes to complete.

Should you choose to participate, you will also be asked to come to a group session in which you will be able to play the Nintendo Wii console with 3 other group members. These sessions will be held twice a week, for 6 weeks. Each session will last up to 1 hour. These gaming sessions will be transcribed at 1, 3 and 6. Transcriptions will be destroyed after analysis. The information obtained will only be

accessible to the researchers named above.

After the last session, you complete the questionnaire package again. Two months later, you will again be asked to complete the questionnaire. We understand that we are asking a lot of you. As a token of our appreciation your place of residence will receive the Wii console to keep.

If you want to participate, you will be asked to complete the Consent Form within one week and return to the researchers. You will have a week to decide, and are encourage to discuss your participation with friends/family. You may withdraw your participation at any time while the study is taking place. You can withdraw by informing any of the researchers, or by simply not attending the gaming sessions, or not returning your questionnaire. Please note that withdrawing from the study will in no way impact on your care.

You are encouraged to discuss any questions that you may have during, or at the conclusion of the study, with any of the researchers. Should you be concerned about any issues raised as a result of participating in this study, please contact one of the researchers, or your doctor. Should you prefer to discuss your issues anonymously, you may wish to contact Lifeline (available 24 hours a day, telephone 131 114).
A summary of the results will be provided to you at the end of the research.
Thank you for considering participation in this research.

If you have any questions, or you would like further information regarding the project titled Wii Console and Well-being Among Older Adults, please contact the Principal Researcher, Associate Professor Suzanne Mclaren of the School of Health Sciences
PH: (03) 53279628
EMAIL: s.mclaren@ballarat.edu.au

Should you (i.e. the participant) have any concerns about the ethical conduct of this research project, please contact the University of Ballarat Ethics Officer, Research Services, University of Ballarat, PO Box 663, Mt Helen VIC 3353.
Telephone: (03) 5327 9765, Email: ub.ethics@ballarat.edu.au

CRICOS Provider Number 00103D

Appendix B

Control Group Plain Language Statement

SCHOOL OF HEALTH SCIENCES

PROJECT TITLE:	The Effects of Playing Wii Alone and With Others on Depression, Sense of Belonging, Social Support and Mood in Australian Nursing Home Residents
PRINCIPAL RESEARCHER:	A/Prof Suzanne McLaren
OTHER/STUDENT RESEARCHERS:	Miss Jessica Chesler, Dr Shaun Watson & Prof. Britt Klein.

Dear Potential Participant,

Thank you for your interest in this research being conducted Miss Jessica Chesler under the supervision of by Associate Professor Suzanne McLaren, Dr Shaun Watson and Professor Britt Klein, from the University of Ballarat. This study will investigate if social support can impact on mood and sense of well being. The information collected will be of value to health professionals who work with older adults.

If you volunteer to participate in this research you will be asked to complete a short test regarding your cognitive ability and some questions about your health to see if it is safe for you to participate in the research. If deemed eligible you will be asked to complete a questionnaire package, which asks for some background information, and questions regarding your mood (e.g., “I felt sad), your relationships with others (e.g., There are people I can depend on to help me if I really need it), your sense of belonging and your current mood. The questionnaire takes about 15 minutes to complete.

After 6 weeks, you will be asked complete the questionnaire package again. Two months later, you will again be asked to complete the questionnaires. We understand that we are asking a lot of you. As a token of our appreciation your place of residence will receive a Wii to keep at the end of the research. The Wii is a video game console that detects movement from a hand held device.

If you want to participate, you will be asked to complete the Consent Form within one week and return it to the researchers. You will have a week to decide, and are encouraged to discuss your participation with friends/family. You may withdraw your participation at any time while the study is taking place. You can withdraw by informing any of the researchers or not returning your questionnaire. Please note that withdrawing from the study will in no way impact on your care.

You are encouraged to discuss any questions that you may have during, or at the conclusion of the study, with any of the researchers. Should you be concerned about any issues raised as a result of participating in this study, please contact one of the researchers, or your doctor. Should you prefer to discuss your issues anonymously, you may wish to contact Lifeline (available 24 hours a day, telephone 131 114).
A summary of the results will be provided to you at the end of the research.
Thank you for considering participation in this research.

If you have any questions, or you would like further information regarding the project titled Wii Console and Well-being Among Older Adults, please contact the Principal Researcher, Associate Professor Suzanne Mclaren of the School of Health Sciences
PH: (03) 53279628
EMAIL: s.mclaren@federation.edu.au

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Appendix C

Intervention Group Consent Form

PROJECT TITLE:	The Effects of Playing Wii Alone and With Others on Depression, Sense of Belonging, Social Support and Mood in Australian Nursing Home Residents
RESEARCHERS:	A/Prof Suzanne McLaren, Miss Jessica Chesler, Dr Shaun Watson Britt Klein.

Code number allocate to the participant:	

Consent – Please complete the following information:

I, ... of . . . . . .
. . . . . .
hereby consent to participate as a subject in the above research study.

The research program in which I am being asked to participate has been explained fully to me, verbally and in writing, and any matters on which I have sought information have been answered to my satisfaction.

I understand that: To ensure responses are recorded accurately, the Wii sessions will be transcribed at
week 1, 3 and 6. No one besides the researchers will see these transcriptions, and following the completion
of the research all files will be destroyed.

I understand that: all information I provide (including questionnaires) will be treated with
the strictest confidence and data will be stored separately from any listing that includes my name
and address.

- aggregated results will be used for research purposes and may be reported in scientific and academic journals
- ***I am free to withdraw my consent at any time during the study in which event my participation in the research study will immediately cease and any information obtained from it will not be used.***
- ***once information has been aggregated it is unable to be identified, and from this point it is not possible to withdraw consent to participate***

SIGNATURE: . . . . . **DATE**: . . . . . .
……

Appendix D

Control Group Consent Form

PROJECT TITLE:	The Effects of Playing Wii Alone and With Others on Depression, Sense of Belonging, Social Support and Mood in Australian Nursing Home Residents
RESEARCHERS:	A/Prof Suzanne McLaren, Miss Jessica Chesler, Dr Shaun Watson Britt Klein.

Code number allocate to the participant:	

Consent – Please complete the following information:

I, ... of . . . . . .
. . . . . .
hereby consent to participate as a subject in the above research study.

The research program in which I am being asked to participate has been explained fully to me, verbally and in writing, and any matters on which I have sought information have been answered to my satisfaction.

I understand that: all information I provide (including questionnaires) will be treated with the strictest confidence and data will be stored separately from any listing that includes my name
and address.

- aggregated results will be used for research purposes and may be reported in scientific and academic journals
- ***I am free to withdraw my consent at any time during the study in which event my participation in the research study will immediately cease and any information obtained from it will not be used.***
- ***once information has been aggregated it is unable to be identified, and from this point it is not possible to withdraw consent to participate***

SIGNATURE: . . . . . **DATE**: . . . . . .
……

Appendix E

Veterans Affairs Saint Louis University Mental Status Exam

Saint Louis University Mental Status Examination (SLUMS)

Name:	
Age:	
Is the Patient Alert?	
Level of Education?	
1. What day of the week is it?	/1
2. What is the year?	/1
3. What state are we in?	/1
4. Please remember these five objects. I will ask you what they are later. Apple Pen Tie House Car	
5. You have $100 and you go to the store and buy a dozen apples for $3 and a tricycle for $20.	
How much did you spend? ($23)	/1
How much do you have left? ($77)	/2
6. Please name as many animals as you can in one minute. 0 points (0-4 animals) 1 point (5-9 animals) 2 points (10-14 animals) 3 points (15+ animals)	/3
7. What were the five objects I asked you to remember? 1 point for each correct (Apple, Pen, Tie, House Car)	/5
8. I am going to give you a series of numbers and I would like you to give them to me backwards. For example, if I say 42, you would say 24. 87 (0 points) 649 (1 point) 8537 (1 point)	/2
9. This is a clock face. Please put the hour markers and the time at ten minutes to eleven 0'clock. Hour markers okay (2 points) Time correct (2 points)	/4
10. Please place an X in the triangle.	/1
Which of the figures is the largest?	/1

11. I am going to tell you a story. Please listen carefully because afterwards, I'm going to ask you some questions about it.

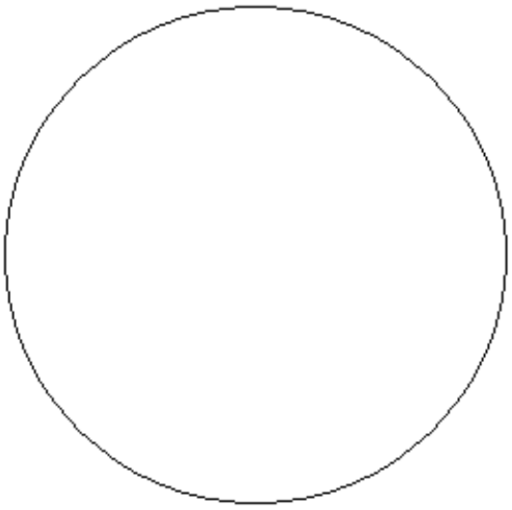
Jill was a very successful stockbroker. She made a lot of money on the stock market. She then met Jack, a devastatingly handsome man. She married him and had three children. They lived in Melbourne. She then stopped work and stayed at home to bring up her children. When they were teenagers, she went back to work. She and Jack lived happily ever after.

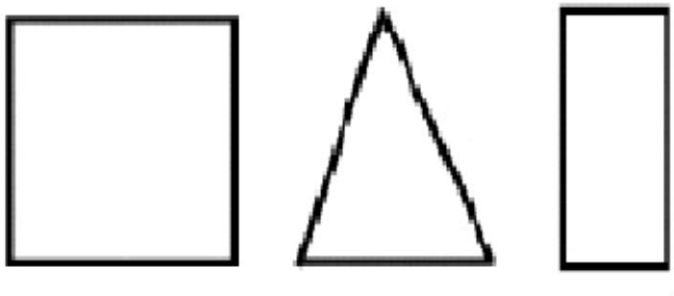
What was the female's name?	/2
When did she go back to work?	/2
What work did she do?	/2
What state did she live in?	/2
Total	/30

Scoring

High School Education		Less than High School Education
27-30	Normal	25-30
21-26	MNCD*	20-24
1-20	Dementia	1-19

*Mild Neurocognitive Disorder.





Appendix F

Demographics

Code number: _____

Demographic Information

1. What is your gender? ☐ Female ☐ Male

2. What is your age? _____.

3. What is the date of your admission? _____.

4. Highest educational level achieved?

☐ Primary School

☐ Secondary School

☐ TAFE/Trade Certificate

☐ University – Undergraduate degree

☐ University – Postgraduate degree

5. What is your relationship status?

☐ Single

☐ Partnered/De factor

☐ Married

☐ Divorced

☐ Widowed

6. What is your perceived health status?

☐ Very Good

☐ Good

☐ Average

☐ Poor

☐ Very Poor

Appendix G

Geriatric Depression Scale Short Form

Instructions: Circle the answer that best describes how you have felt over the past week.

1 Are you basically satisfied by your life?	Yes	No
2 Have you dropped many of your activities and interests?	Yes	No
3 Do you feel that your life is empty?	Yes	No
4 Do you often get bored?	Yes	No
5 Are you in good spirits most of the time?	Yes	No
6 Are you afraid that something bad is going to happen to you?	Yes	No
7 Do you feel happy most of the time?	Yes	No
8 Do you often feel helpless?	Yes	No
9 Do you prefer to stay at home, rather than going out and doing things?	Yes	No
10 Do you feel that you have more problems with your memory than most?	Yes	No
11 Do you think it is wonderful to be alive now?	Yes	No
12 Do you fell worthless the way you are now?	Yes	No
13 Do you feel full of energy?	Yes	No
14 Do you feel that your situation is hopeless?	Yes	No
15 Do you think that most people are better off than you?	Yes	No

Appendix H

Social Provisions Scale

Instructions: In answering the following questions, think about your current relationships with other residents and staff. Please indicate to what extent each statement described your current relationships with other people. Use the following scale to indicate your opinion.

STRONGLY DISAGRE	DISAGREE	AGREE	STRONGLY AGREE
1	2	3	4

So, for example, if you feel a statement is very true of your current relationships, you would respond with a 4 (strongly agree). If you feel that a statement clearly does not describe your relationships, you would respond with a 1 (strongly disagree)

		Rating
1.	There are people I can depend on to help me if I really need it.	_____
2.	I feel that I do not have close personal relationships with other people.	_____
3.	There is no one I can turn to for guidance in times of stress.	_____
4.	There are people who depend on me for help.	_____
5.	There are people who enjoy the same social activities I do	_____
6.	Other people do not view me as competent.	_____
7.	I feel personally responsible for the well-being of another person.	_____
8.	I feel part of a group of people who share my attitudes and beliefs.	
9.	I do not think other people respect my skills and abilities.	_____
10.	If something went wrong, no one would come to my assistance.	_____
11.	I have close relationships that provide me with a sense of emotional security and well-being.	_____
12.	There is someone I could talk to about important decisions in my life.	_____
13.	I have relationships where my competence and skill are recognised.	_____
14.	There is no one who shares my interests and concerns.	_____
15.	There is no one who really relies on me for their well-being.	_____

STRONGLY DISAGRE	DISAGREE	AGREE	STRONGLY AGREE
1	2	3	4

16. There is a trust worthy person I could turn to for advise if I were having problems. _____
17. I feel a strong emotional bond with at least one other person. _____
18. There is no one I can depend on for aid if I really need it. _____
19. There is no one I feel comfortable talking about problems with. _____
20. There are people who admire my talents and abilities. _____
21. I lack a feeling of intimacy with another person. _____
22. There is no one who likes to do the things I do. _____
23. There are people who I can count on in an emergency. _____
24. No one needs me to care for them. _____

Appendix I:

Sense of Belonging Visual Analogue Scales

Instructions: Please place a vertical line to indicate the extent to which you endorse each statement.

How valued do you feel right now, a mark on the line to the left represents not valued at all, towards the right, completely valued.

Not Valued at all Completely Valued

Do you feel that you fit in right now, a mark on the line to the left represents do not fit in at all, towards the right, completely fit in.

Not fit in at all Completely fit in

Appendix J

Mood Visual Analogue Scale

Instructions: Please place a vertical line to indicate the extent to which you endorse each statement.

How is your mood right now, a mark on the line to the left represents your worst mood, towards the right, your best.

Worst Mood Best Mood

Appendix K

Post-Intervention Evaluation Questionnaire

What was good about playing Wii with others?

What was your favourite thing?

What was bad about playing the Wii with others?

Was there any part of playing the Wii that you found very hard?

Would you prefer to play with Wii alone?

Would you continue to play Wii in the future?

Would you prefer the session to be longer or shorter?

Any further comments?